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17

DEPARTMENT OF OCEANOGRAPHY



## SUMMARY OF NORTH PACIFIC WEATHER STATION BATHYTHERMOGRAPH DATA

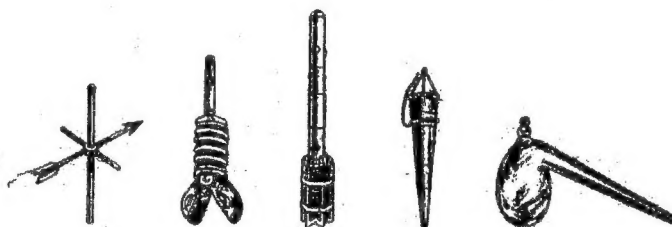
1943 - 1952

Office of Naval Research  
Contract N7 onr-487 T.O. 3  
Geophysics Branch

Navy Department  
Project NR 083-061  
Technical Report No. 7

Dale F. Leipper and Project Staff  
January, 1954

Research Conducted for the  
*Texas A. & M. Research Foundation*  
COLLEGE STATION, TEXAS



The Agricultural and Mechanical College of Texas  
Department of Oceanography  
College Station, Texas

Texas A and M Research Foundation  
Project 29

**SUMMARY OF NORTH PACIFIC  
WEATHER STATION BATHYTHERMOGRAPH DATA**

**1943-1952**

(Technical Report No. 7)

Project 29 is a study of the atmospheric influence on the thermal structure of the oceans sponsored by the Office of Naval Research (Project NR 083-061, Contract N7onr-487, Task Order 3).

January, 1954

Dale F. Leipper  
and  
Project Staff

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Figures 4, 7, 10, 13, ..., 64. Depths to Selected Differences from Sea Surface Temperature

...

Figures	Location	Date
2, 3, 4	50°00'N, 145°00'W	July 1949 - June 1950
5, 6, 7	50°00'N, 145°00'W	July 1950 - June 1951
8, 9, 10	49°00'N, 148°00'W	July 1948 - June 1949
11, 12, 13	49°00'N, 148°00'W	July 1949 - June 1950
14, 15, 16	48°00'N, 162°00'E	July 1950 - June 1951
17, 18, 19	48°00'N, 162°00'E	July 1951 - June 1952
20, 21, 22	40°00'N, 150°00'W	July 1943 - June 1944
23, 24, 25	40°00'N, 150°00'W	July 1944 - June 1945
26, 27, 28	40°00'N, 142°00'W	July 1949 - June 1950
29, 30, 31	38°00'N, 158°00'W	July 1946 - June 1947
32, 33, 34	33°00'N, 135°00'W	July 1950 - June 1951
35, 36, 37	33°00'N, 135°00'W	July 1951 - June 1952
38, 39, 40	31°00'N, 164°00'E	July 1951 - June 1952
41, 42, 43	30°00'N, 140°00'W	July 1946 - June 1947
44, 45, 46	30°00'N, 140°00'W	July 1947 - June 1948
47, 48, 49	30°00'N, 140°00'W	July 1948 - June 1949
50, 51, 52	30°00'N, 140°00'W	July 1949 - June 1950
53, 54, 55	28°00'N, 145°00'W	July 1950 - June 1951
56, 57, 58	28°00'N, 145°00'W	July 1951 - June 1952
59, 60, 61	25°41'N, 149°00'W	July 1945 - June 1946
62, 63, 64	12°45'N, 180°00'	July 1945 - June 1946

...

## INTRODUCTION

The information in this report was obtained from BT (bathythermograph) data collected at or near (within a radius of nine miles) the assigned positions of North Pacific Weather Ships. The observations are on file at the Scripps Institution of Oceanography and were loaned to Texas A. & M. for this study. The methods of handling these data were given in detail in Technical Report No. 1 of this project, Some Methods Used in Representing Bathythermograph Data, but will be restated briefly here.

For each year in which there are sufficient data at a given station to warrant this type of study, three time graphs have been drawn. These are:

- 1) Depth of mixed layer and of water  $2^{\circ}\text{F}$  colder than the mixed layer;
- 2) Temperature at selected depths; and
- 3) Depths of selected differences from sea surface temperature.

To obtain these time graphs of BT data, a procedure involving four separate steps was employed:

1. Selection of cards. Only one card was used to represent a particular day. This card was one selected as being typical for that day, factors considered being sea surface temperature, depth of mixed layer, depth and nature of the thermocline, time of observation and general character of the curve. When possible, the observation made nearest to 2100 hours (GCT) was chosen.

2. Reading of cards. A team of two people was used for all card reading, each reading being checked to assure accuracy. Temperatures at ten chosen depths (0, 30, 50, 75, 100, 150, 200, 250, 350 and 450 feet) were read, with an agreement between readers of  $\pm 0.1^{\circ}\text{F}$  being required for each depth. The depth of the mixed layer (this depth being defined as the depth to a  $\pm 0.3^{\circ}\text{F}$  change from the temperature of the sea surface) and the depth of water  $2^{\circ}\text{F}$  colder than the mixed layer were read, the required agreement in these cases being  $\pm 3$  feet. Finally the depths of selected differences from sea surface temperature were read, agreement again being  $\pm 3$  feet.

3. Smoothing of data. A running five-day average was determined to make a picture showing the nature of gradual changes with time. The value for a particular day was obtained by averaging the value for that day with the two immediately preceeding and the two following days. Exceptions occurred at the beginning or end of a series of days or at places where for one or two days there were no data available. In these cases four-day or, in a few cases, three-day averages were used. It should be noted that all curves are five-day running mean curves.

4. Plotting of data. The final step consisted of plotting the data in the form which appears in this report. It should be noted that only the values for the surface, 100, 200 and 350 foot depths have been plotted for temperatures at selected depths. In those cases where isothermal conditions exist, only the temperature for the lowest depth has been plotted. Thus when the curve for a particular

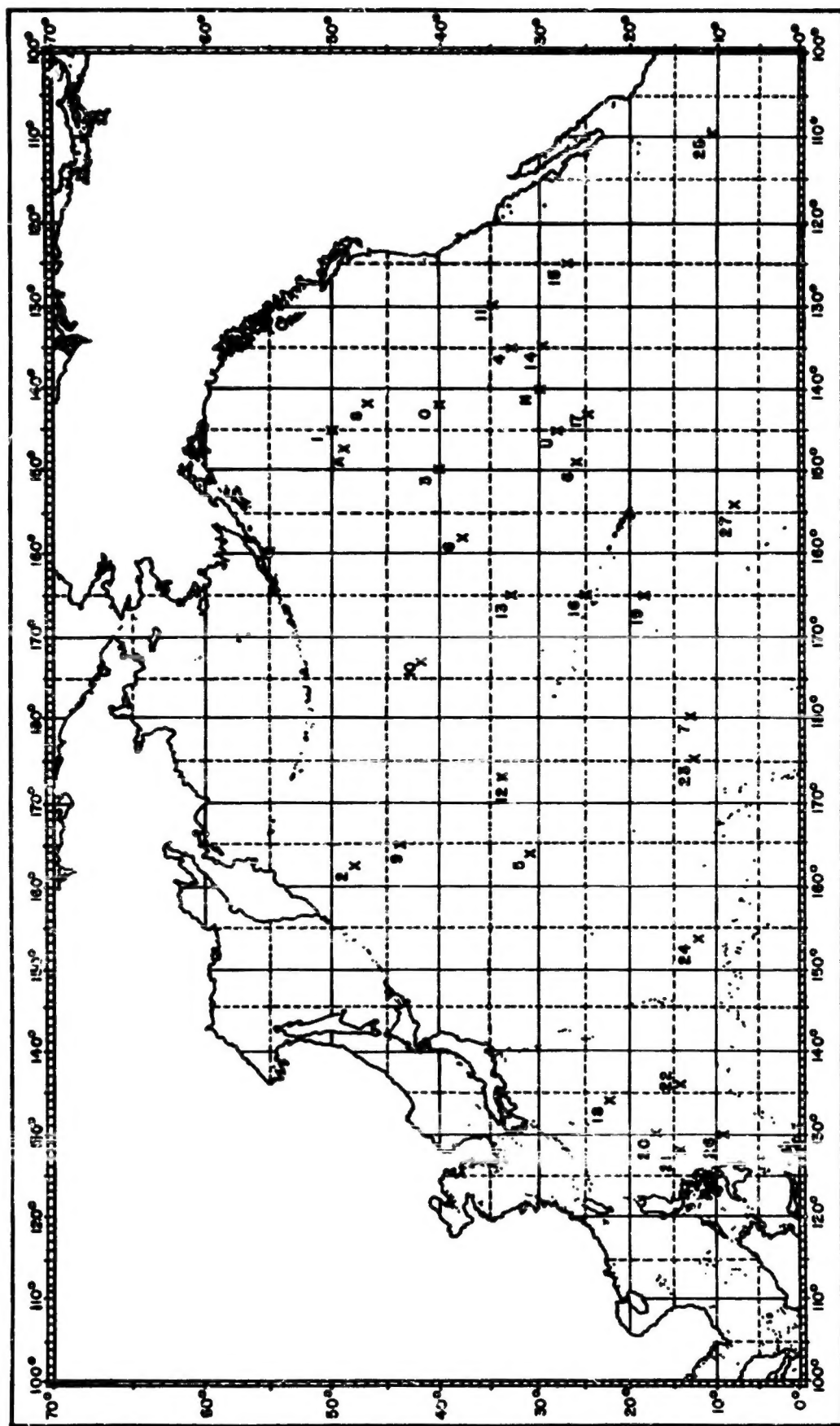
depth does not appear on the graph, the temperature at this depth is the same as the temperature of the next lower curve which does appear. On all graphs the days for which no observations were available are indicated as are the days on which shallow (150 foot) bathythermographs were used.

The years for which data for the various weather stations have been plotted and reproduced in this report appear in the List of Figures, page ii. Stations for which data were received but not plotted are listed in the Legend for Figure 1.

Data in this report appear only in the final plotted form. However, copies of the data in both unsmoothed and smoothed preliminary form are on file in the Department of Oceanography.

In addition to the project supervisor, Dr. Dale F. Leipper, the following people took part in the work: Richard M. Adams worked out the detailed procedure. Mrs. Jeanneane L. Cline, Mrs. Merle A. Cobb and Mrs. Jeanne Burja drafted the charts. Talmage Y. Hicks, Thomas G. Roetzel, Albert B. Turner, Ernest A. Prochaska, Edward Ruhnke, Melvin L. Pierce, John A. Rosenquest, Van Rudolph Cammack, Mrs. Ella Frances Spears, Mrs. Marilyn C. Johnson and Mrs. Jeanneane L. Cline read BT cards and processed the data. Jeanneane L. Cline was in charge of the organization and reproduction of this report.

A similar report containing North Atlantic BT data was published by this project as Technical Report No. 3, Summary of North Atlantic Weather Station Bathythermograph Data 1946-1950, in September 1952.



LOCATION OF WEATHER STATIONS  
FIGURE I



# LEGEND FOR FIGURE 1

Designation	Location
1	50°00'N, 145°00'W
A	49°00'N, 148°00'W
2	48°00'N, 162°00'E
3	40°00'N, 150°00'W
O	40°00'N, 142°00'W
G	38°00'N, 158°00'W
4	33°00'N, 135°00'W
5	31°00'N, 164°00'E
N	30°00'N, 140°00'W
U	28°00'N, 145°00'W
6	25°41'N, 149°00'W
7	12°45'N, 180°00'

Stations 1 through 7 (including those with letter designations) have data in the final drafted form. BT cards were received for the following stations, but they were either outside the nine mile limit or there was not a sufficient amount of data to merit final processing, however the data is on file in a preliminary form:

8	47°00'N, 142°00'W
9	44°00'N, 165°00'E
10	42°00'N, 173°00'W
11	34°45'N, 129°49'W
12	34°00'N, 173°00'E
13	33°00'N, 165°00'W
14	29°40'N, 134°50'W
15	27°00'N, 125°00'W
16	25°00'N, 165°00'W
17	24°40'N, 142°50'W
18	22°00'N, 134°00'E
19	18°20'N, 165°00'W
20	17°00'N, 130°00'E
21	14°00'N, 128°00'E
22	14°00'N, 136°00'E
23	12°20'N, 175°30'E
24	11°55'N, 153°40'E
25	10°18'N, 109°13'W
26	09°00'N, 130°00'E
27	08°00'N, 154°00'W

# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

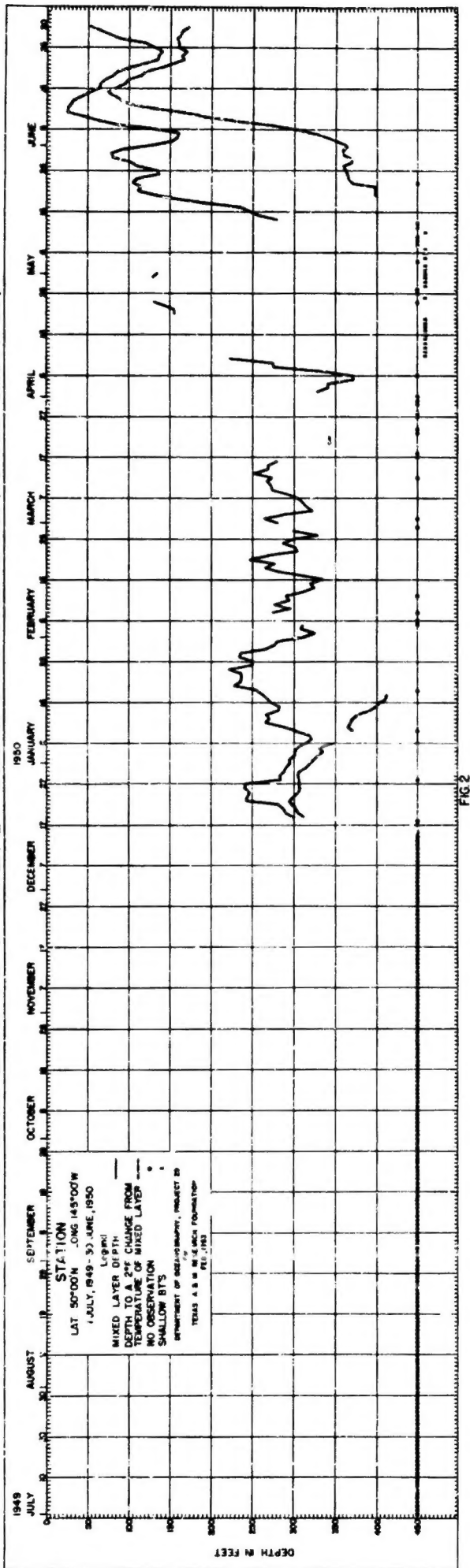


FIG 2

# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

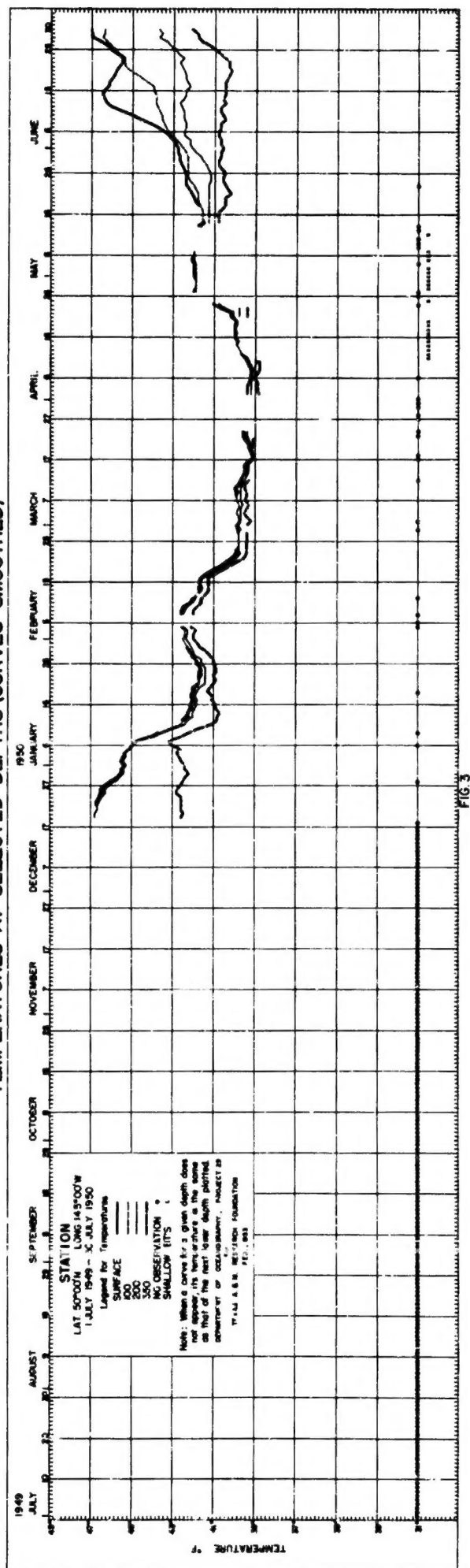
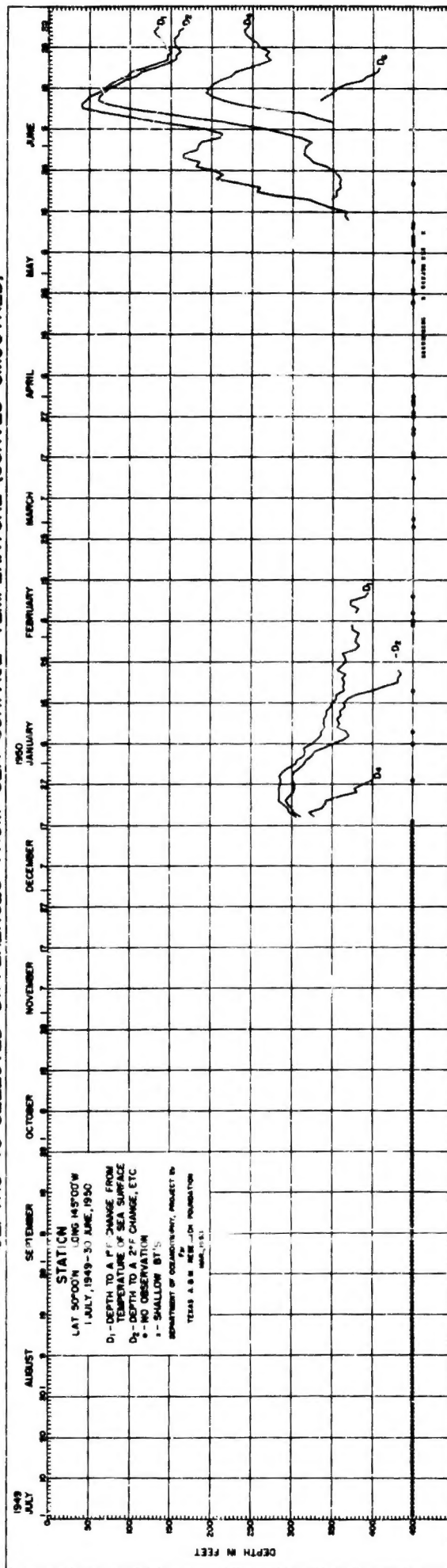


FIG 3



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

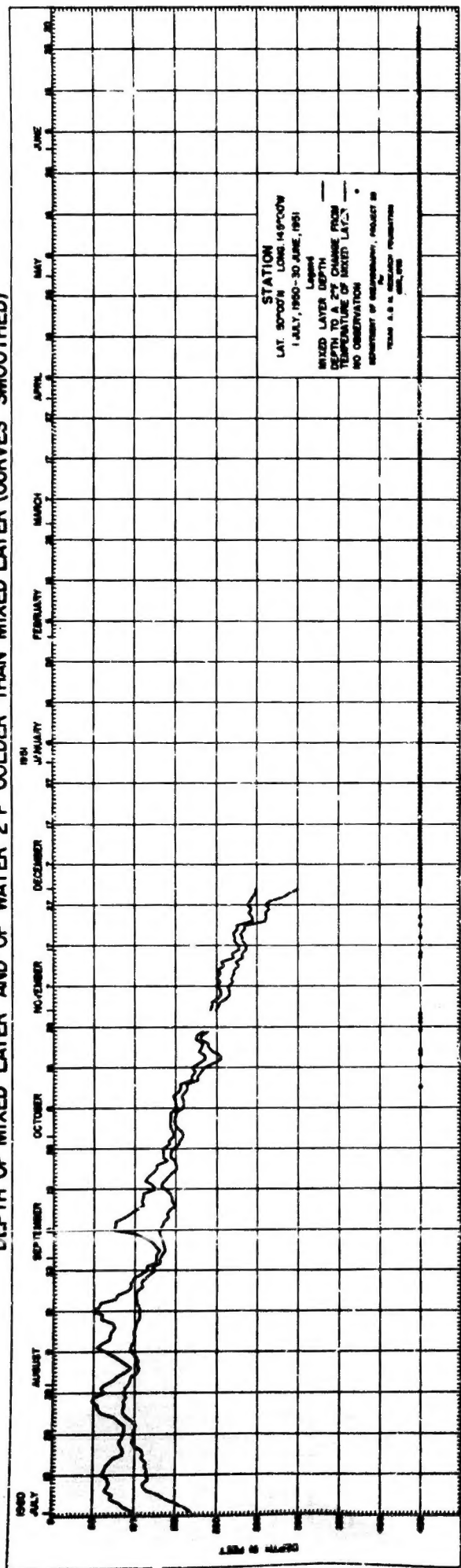


FIG. 5

# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

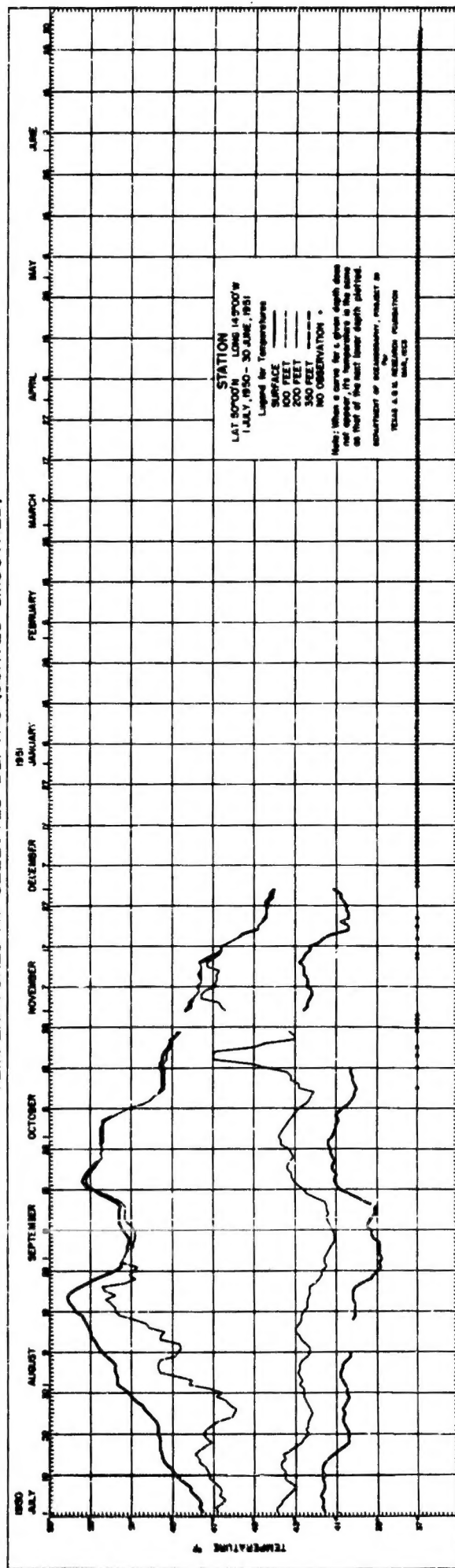


FIG. 6

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

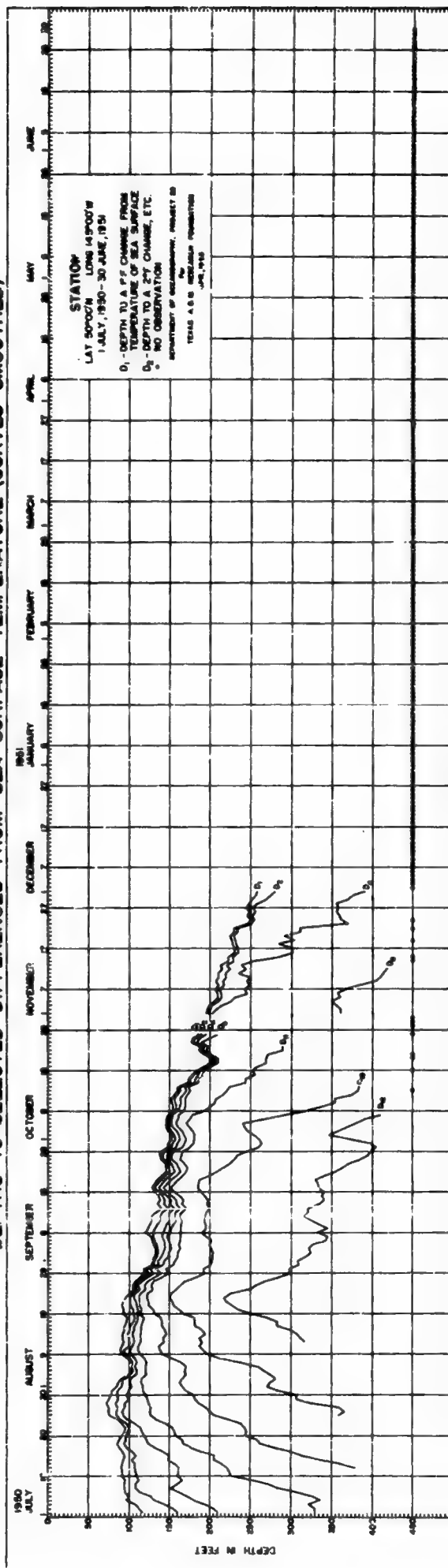
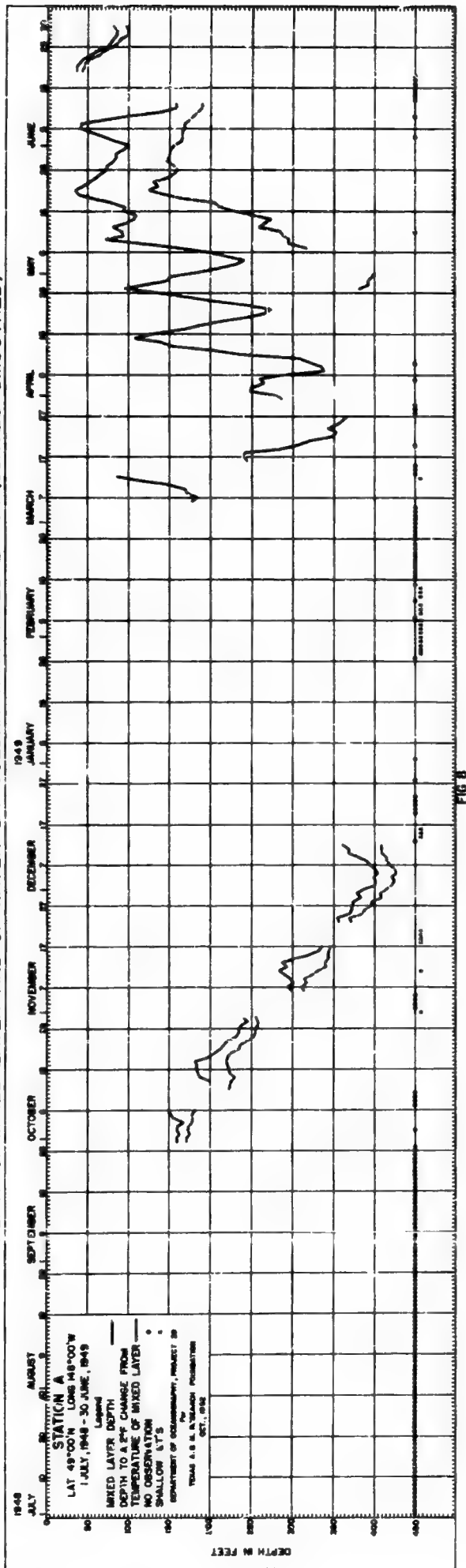
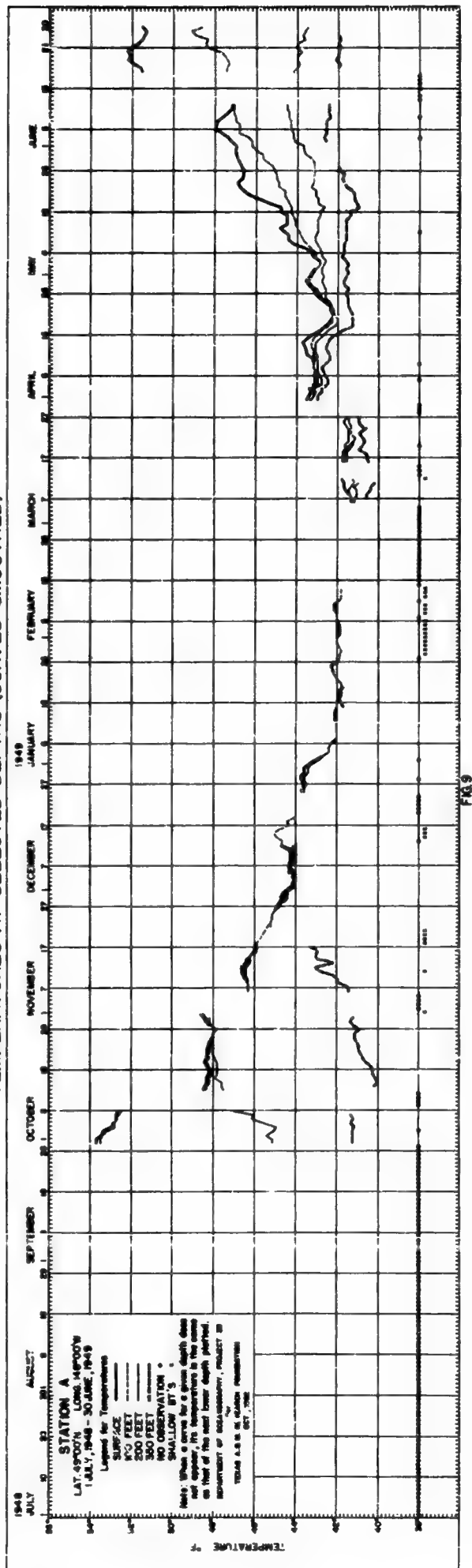


FIG. 7

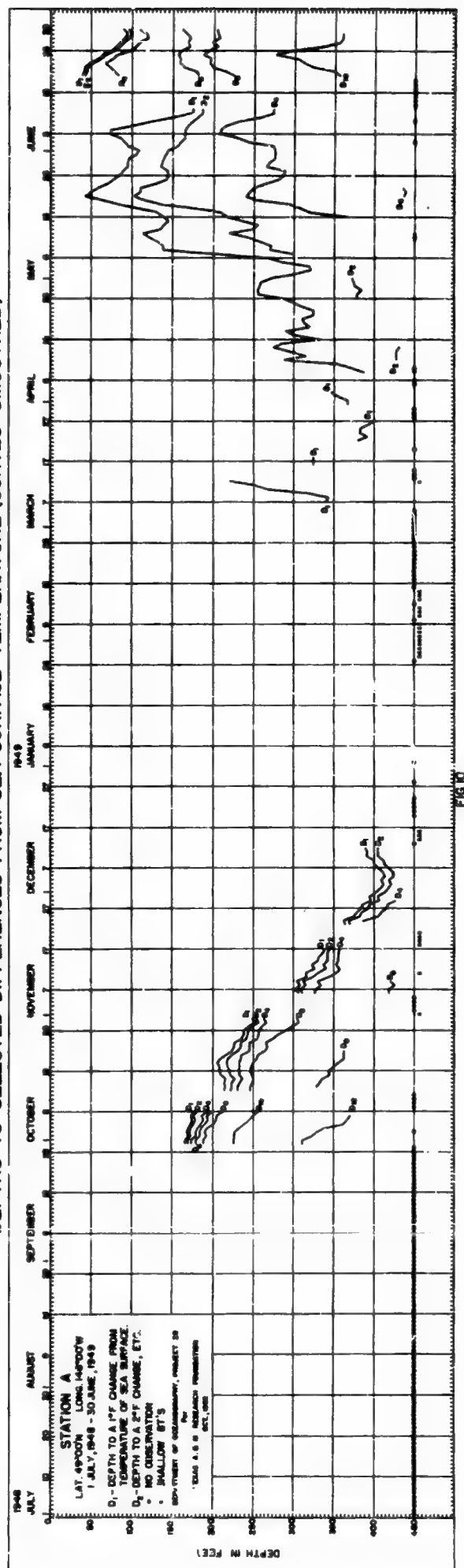
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

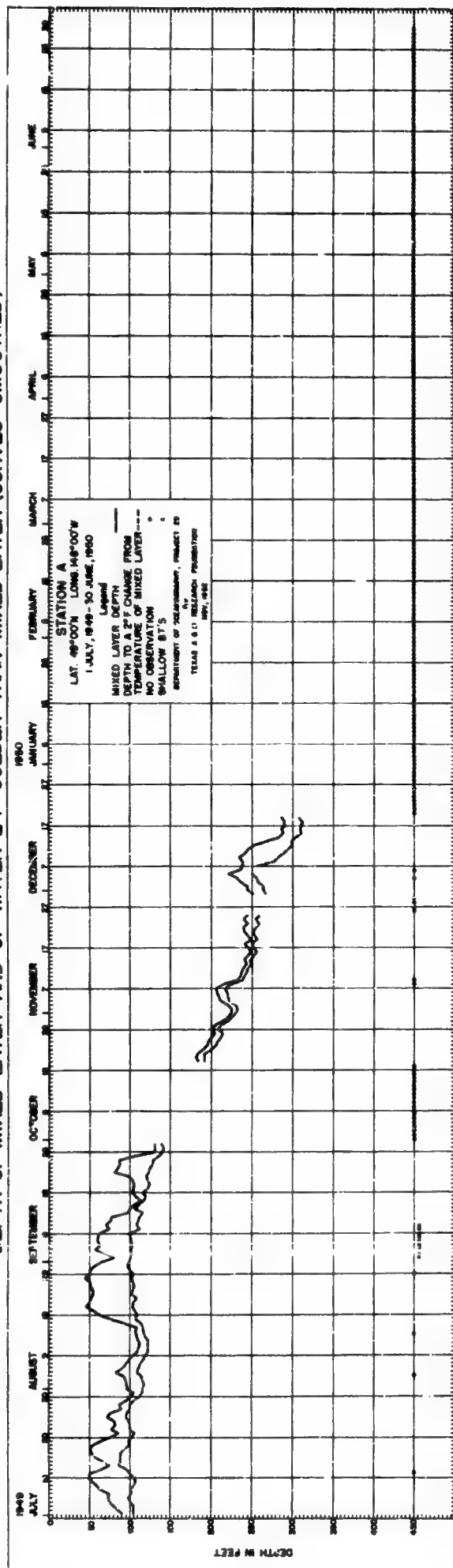


FIG 11

# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

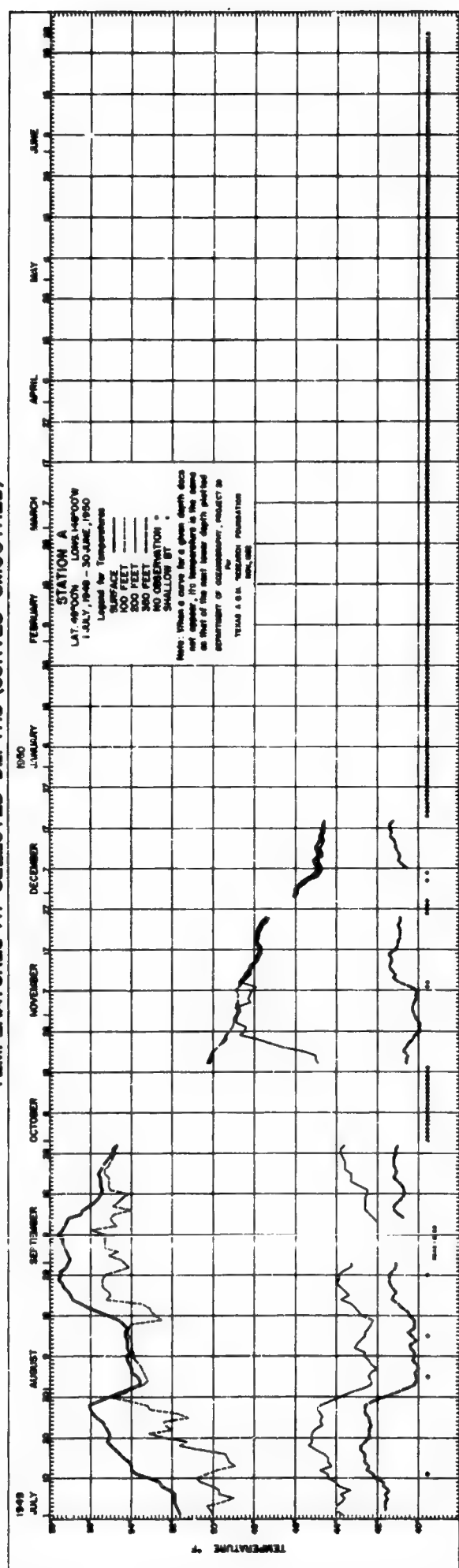
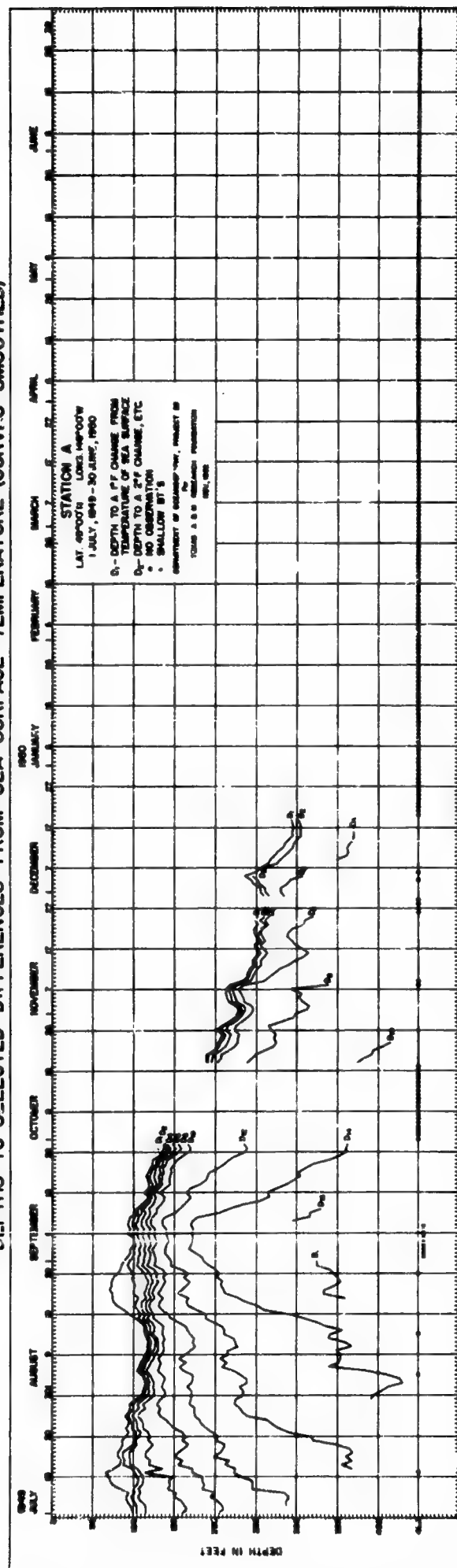


FIG 12



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



FK15

# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

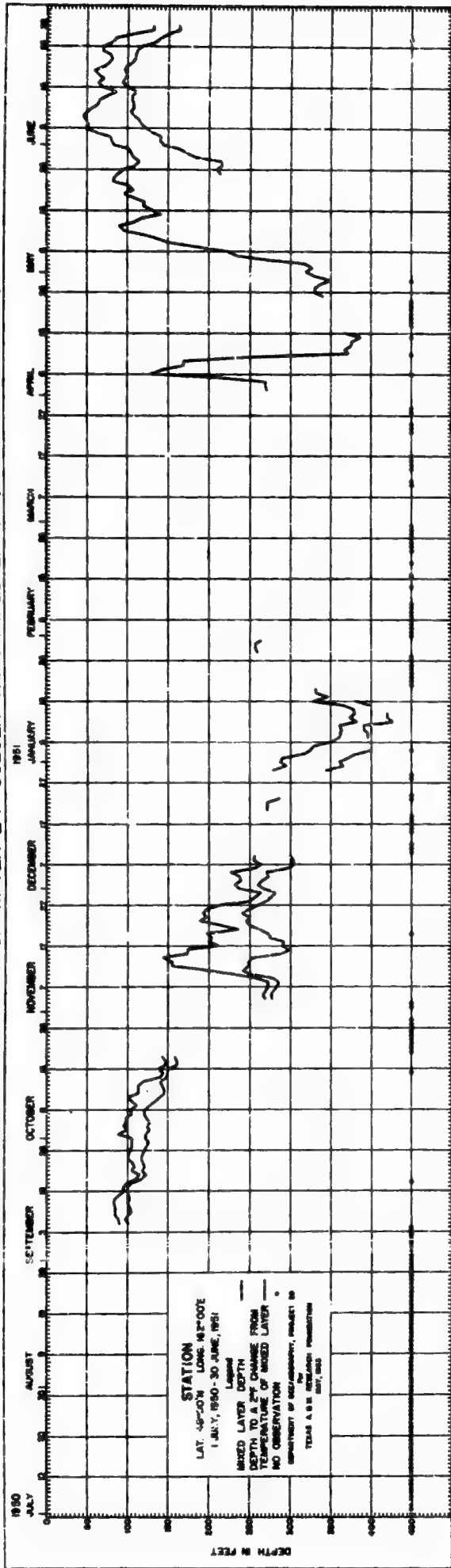


FIG 14

# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

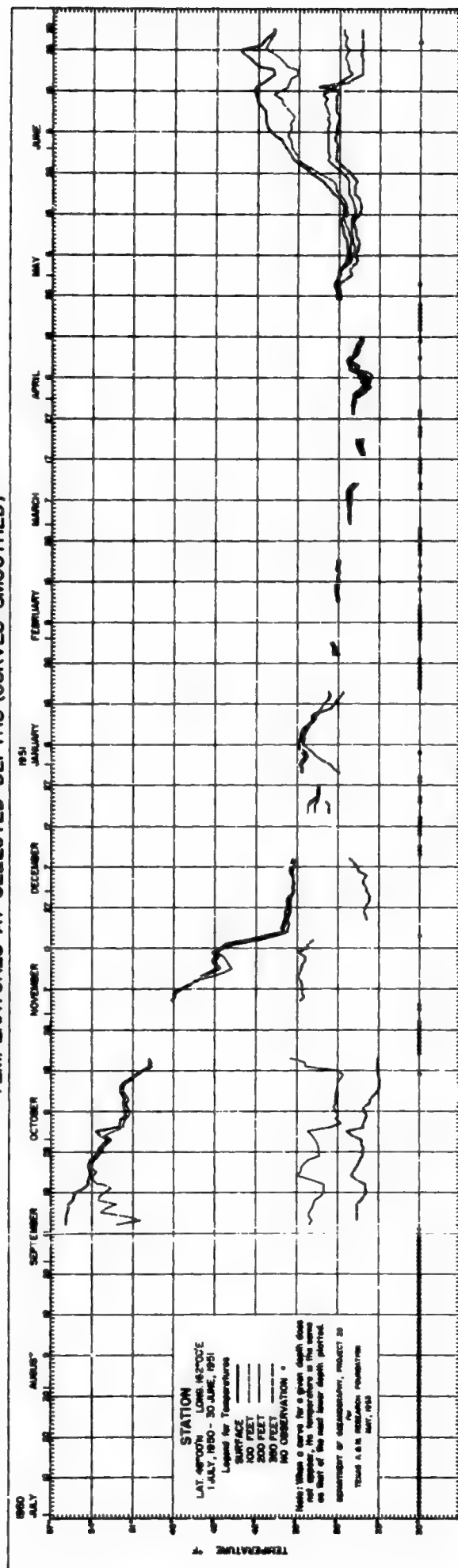
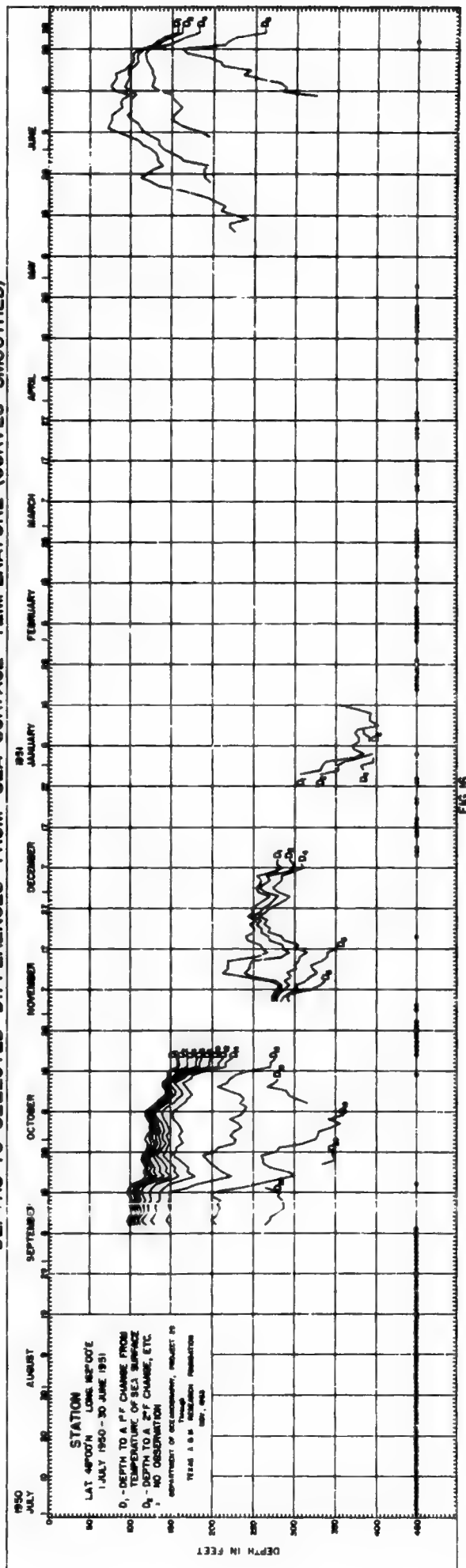
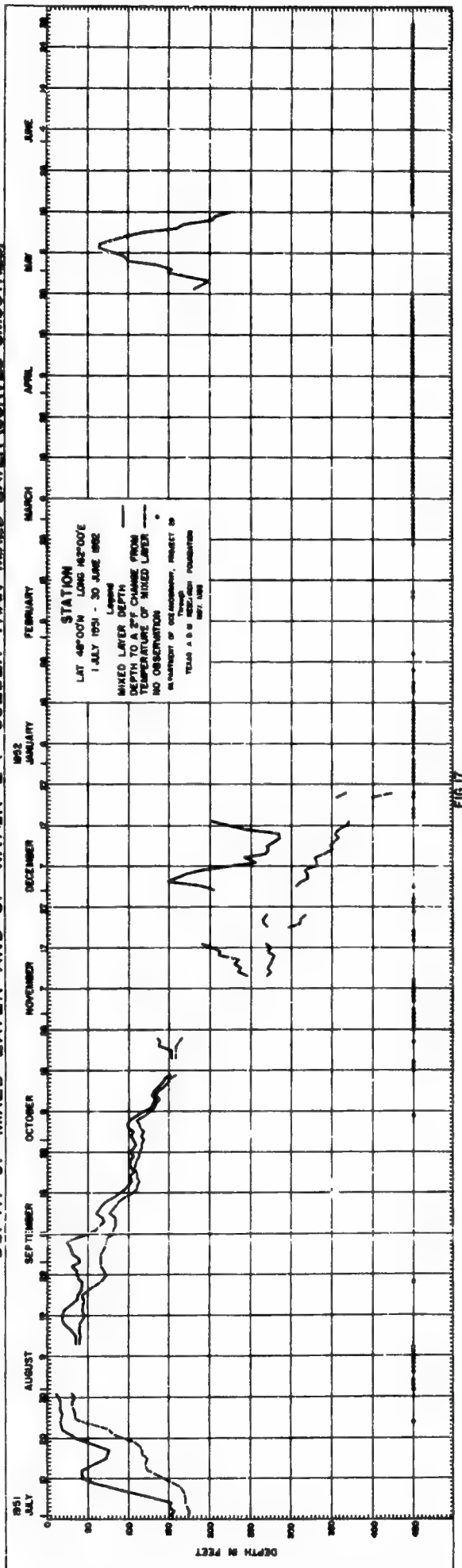


FIG 15

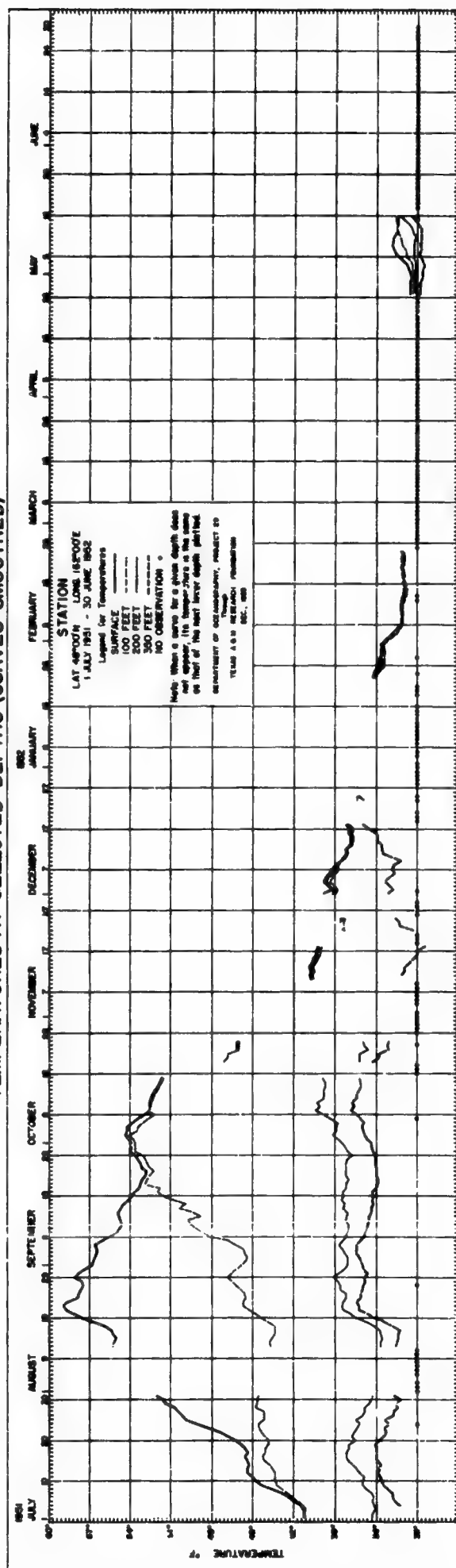
# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



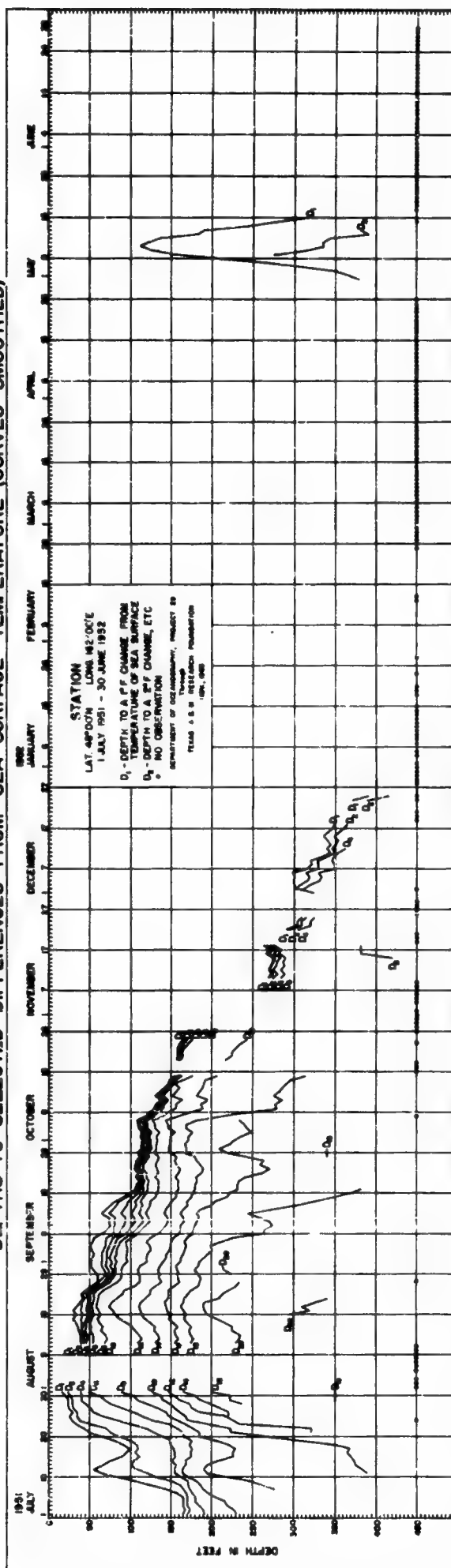
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



**DEPTHs TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)**



६।१।३

STATION  
 LAT 40°00'N LONG 150°00'W  
 1 JULY, 1943 - 30 JUNE, 1944  
 Lined  
 MIXED LAYER DEPTH  
 DEPTH TO A 1° CHANGE FROM  
 TEMPERATURE OF MIXED LAYER  
 NO OBSERVATION  
 DEPARTMENT OF OCEANOGRAPHY, PROJECT 05  
 YELLO 4 8 8 8 NEW ARDEN PUBLICATION  
 MAY 1945

1943 JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER JANUARY FEBRUARY MARCH APRIL MAY JUNE 1944

DEPTH IN FEET  
 0  
 20  
 40  
 60  
 80  
 100  
 120  
 140  
 160  
 180  
 200  
 220  
 240  
 260  
 280  
 300  
 320  
 340  
 360  
 380  
 400  
 420  
 440  
 460  
 480  
 500  
 520  
 540  
 560  
 580  
 600  
 620  
 640  
 660  
 680  
 700  
 720  
 740  
 760  
 780  
 800  
 820  
 840  
 860  
 880  
 900  
 920  
 940  
 960  
 980  
 1000

**STATION**  
LAT 40°00'N LONG 150°00'W  
1 JULY 1943 - 31 JUNE 1944

**Legend for Temperature**

- SURFACE —————
- 100 -----
- 350 - · - · - ·

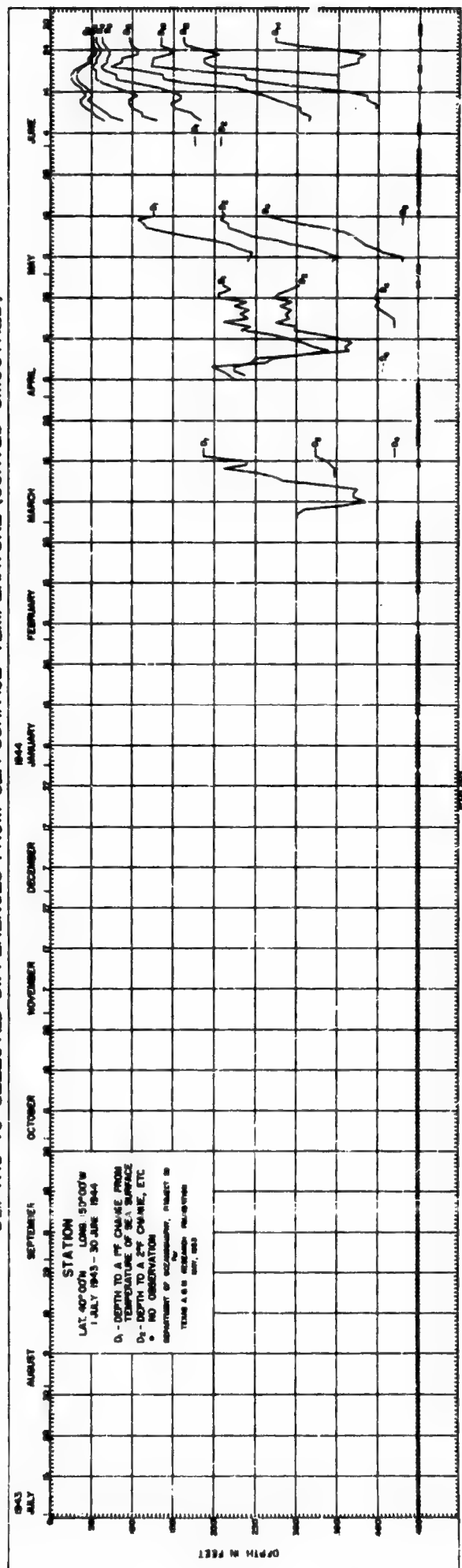
**NO OBSERVATION \***

\*Note: When a curve for a given depth does not appear, its temperature is the same as that of the next lower depth plotted in proximity of occurrence. INJECT IN TEMPERATURE.

TEXAS A & M OCEANOGRAPHIC INSTITUTION MAY, 1953



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

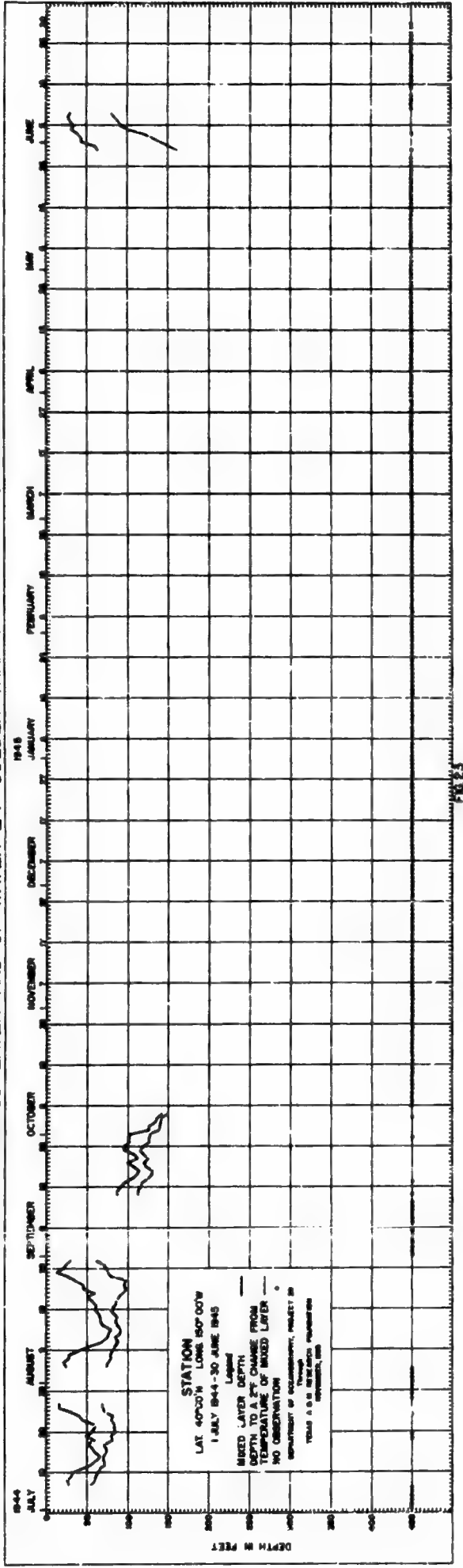


FIG 23

TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

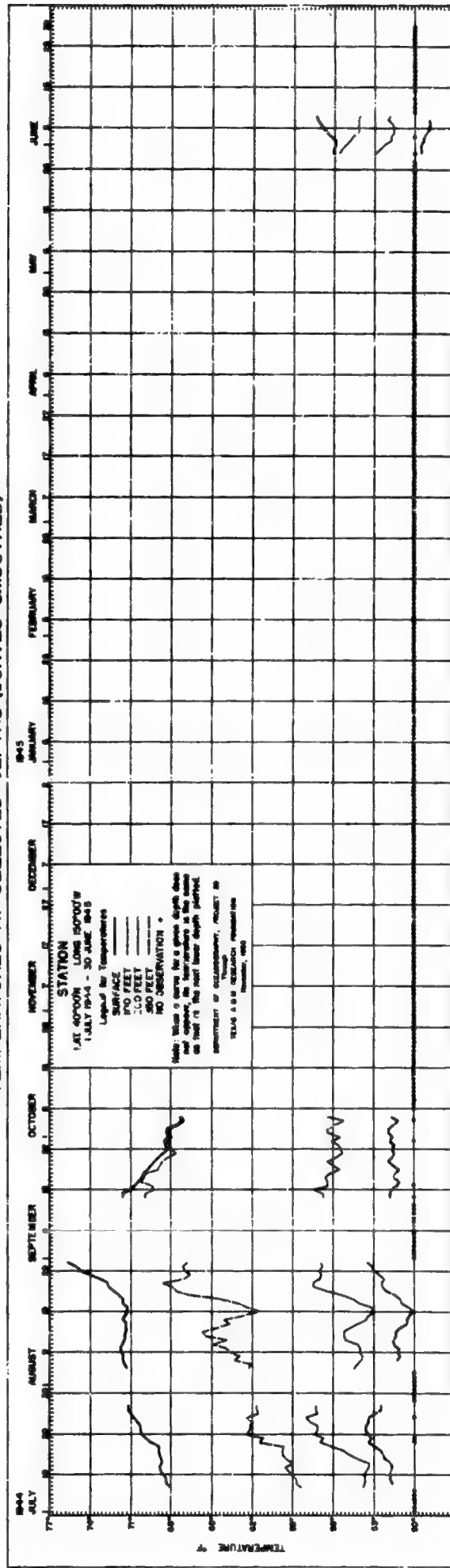
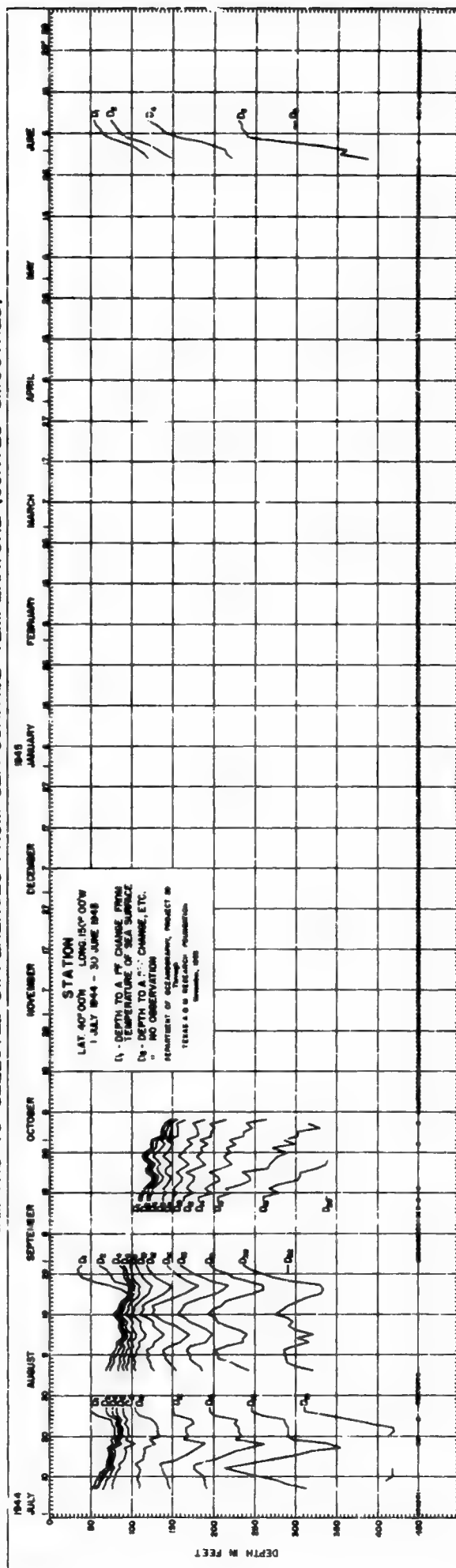
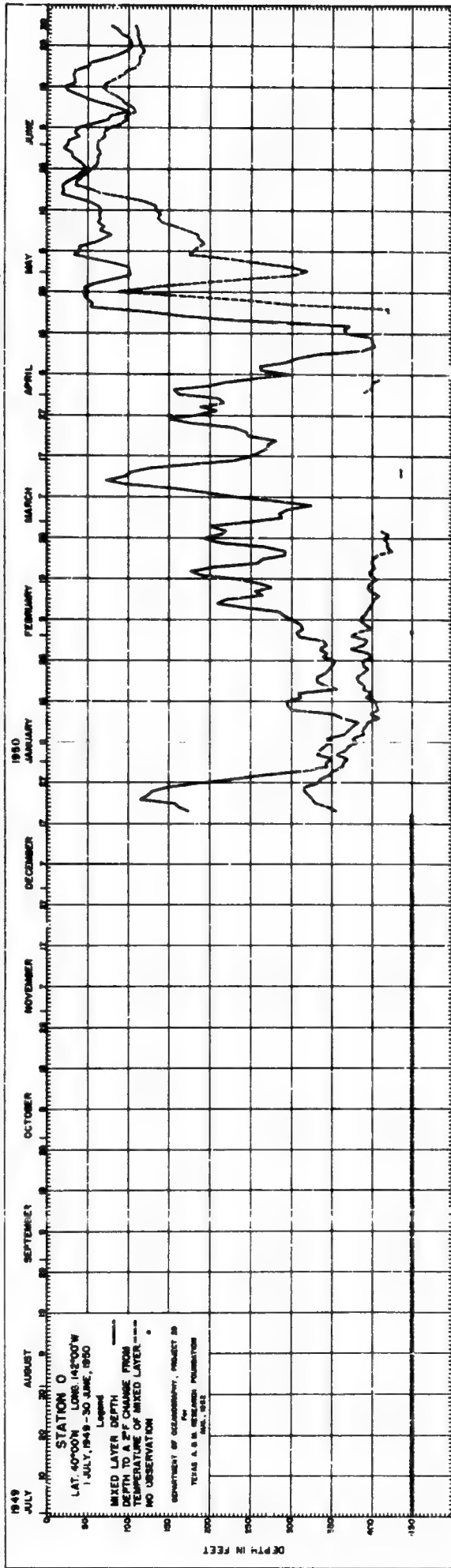


FIG 24

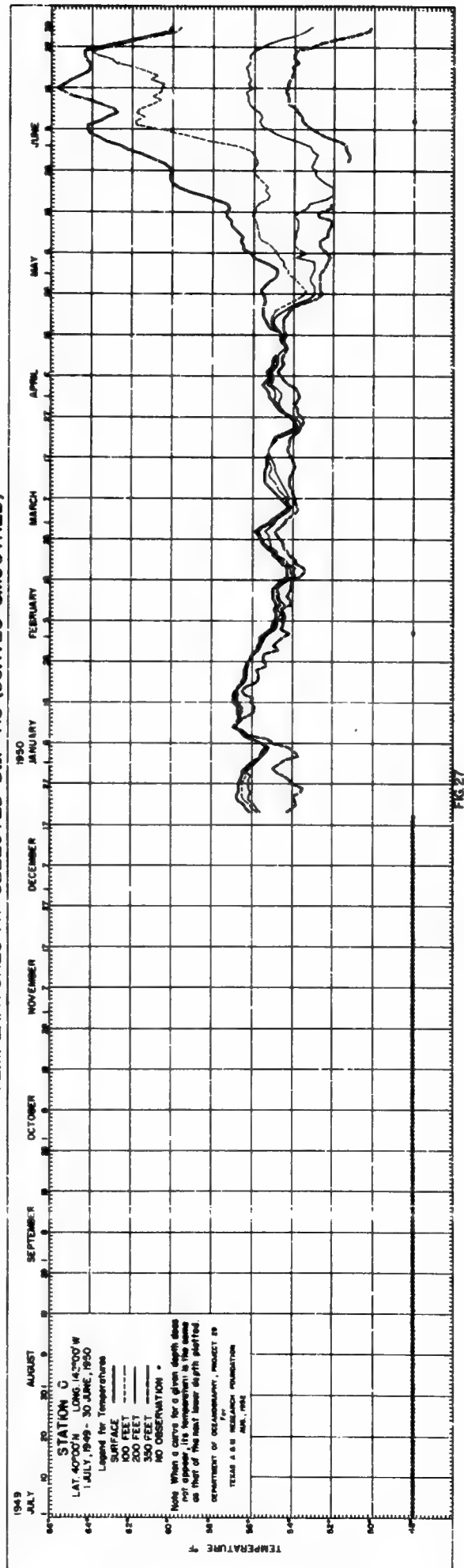
DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



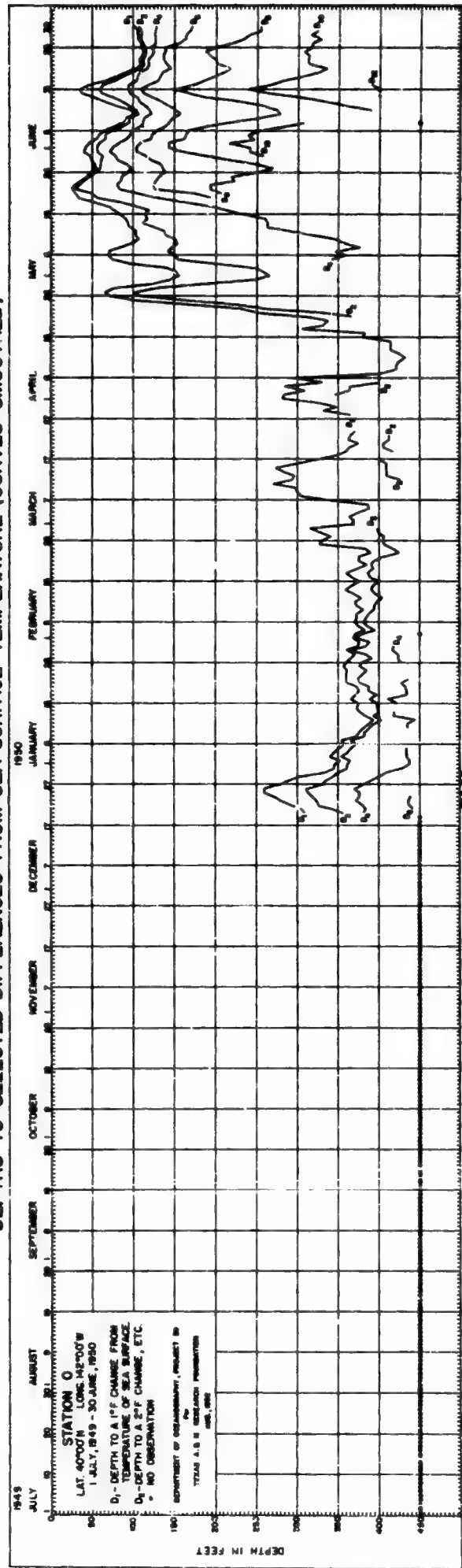
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



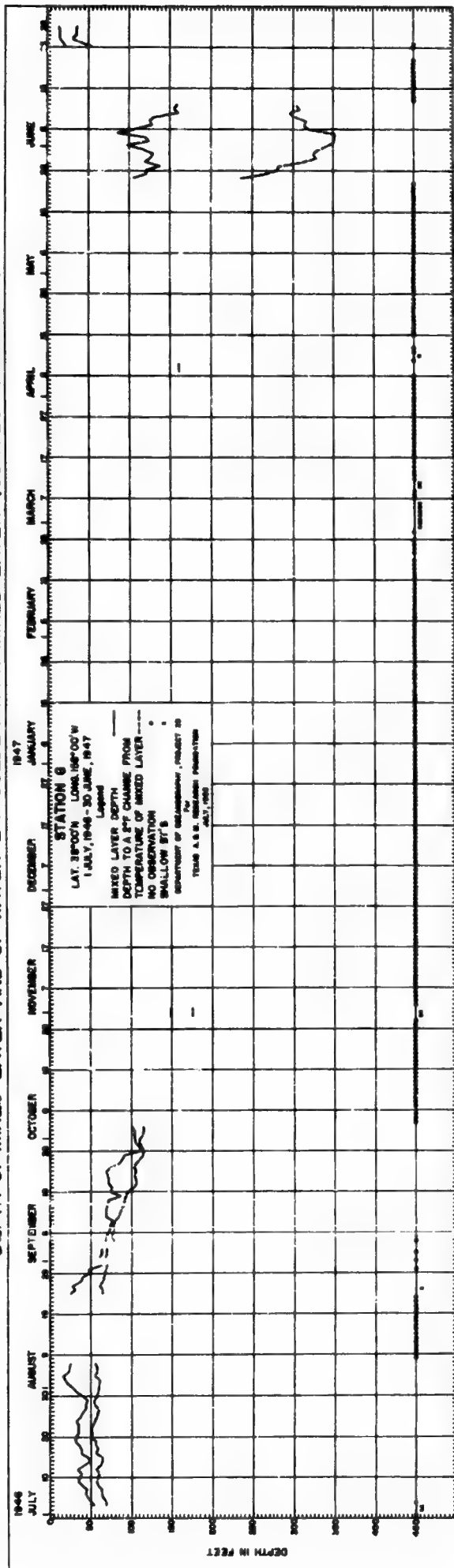
# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



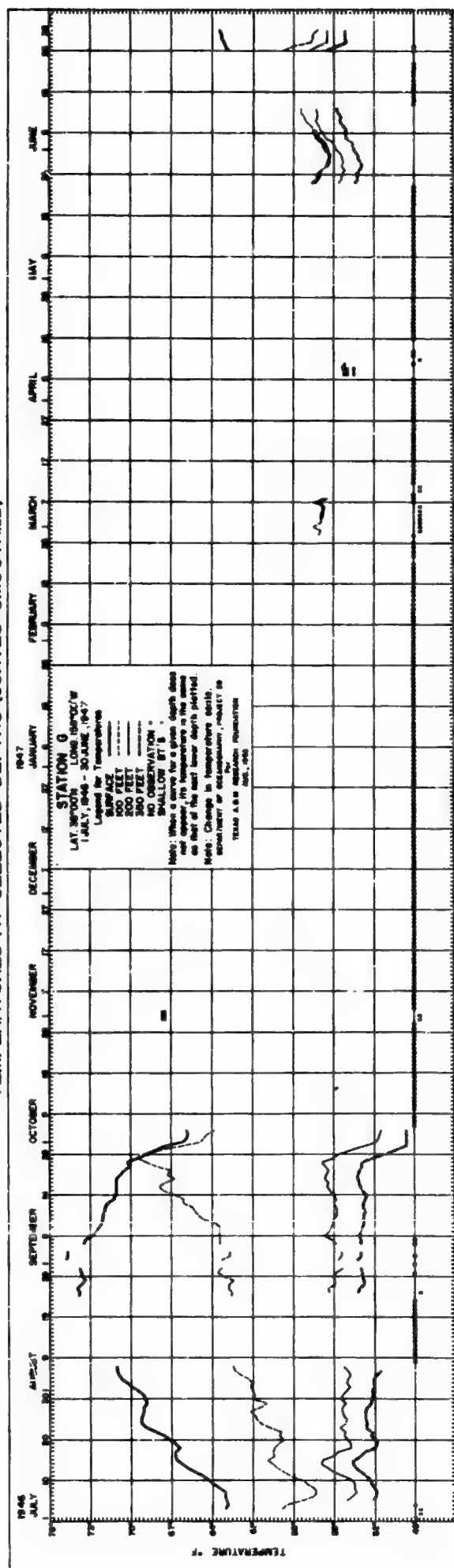
# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

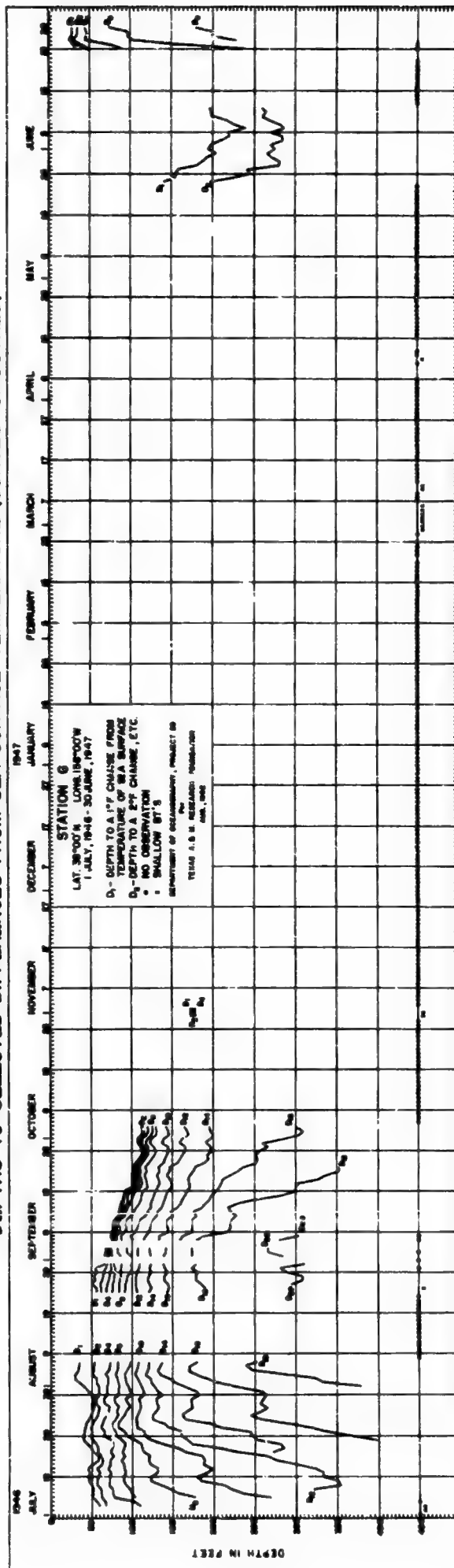


# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)





# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

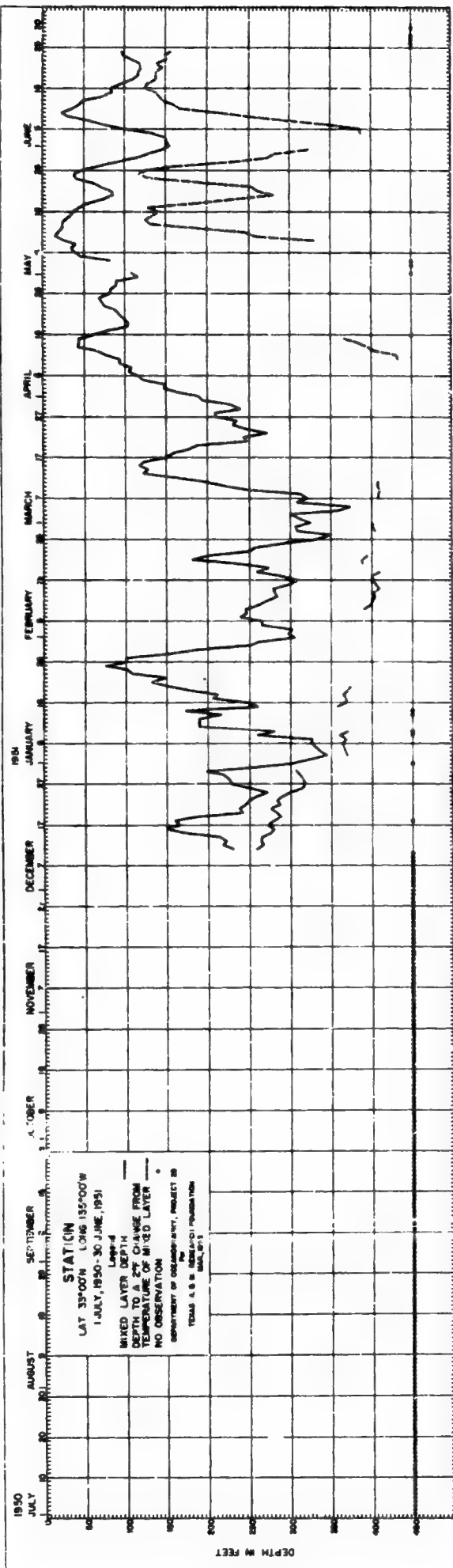


FIG 32

TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

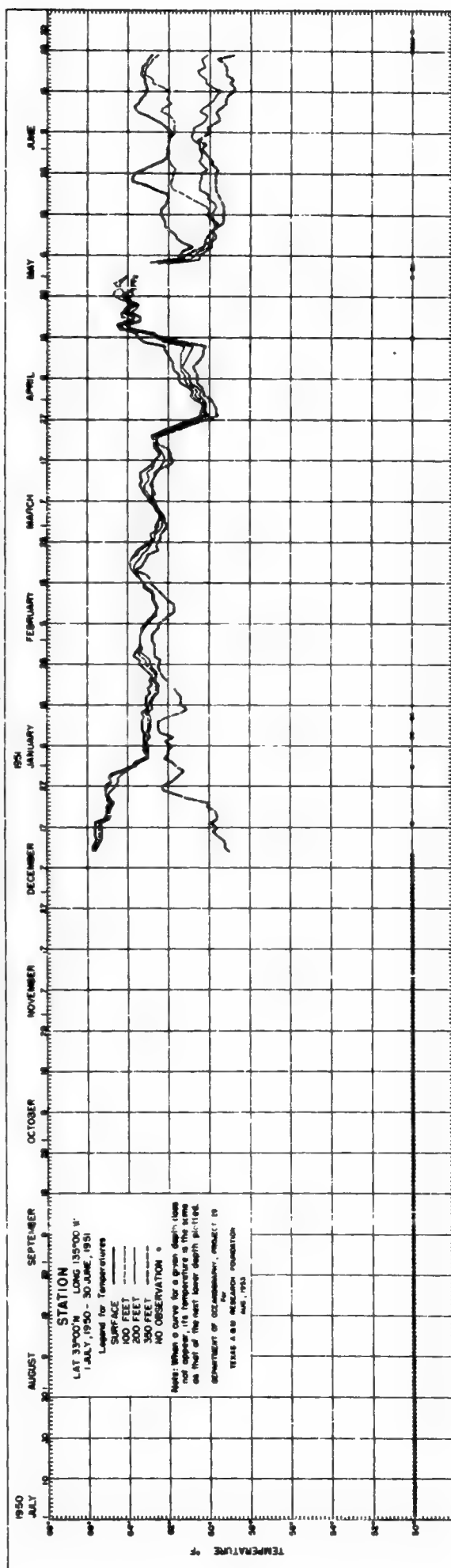
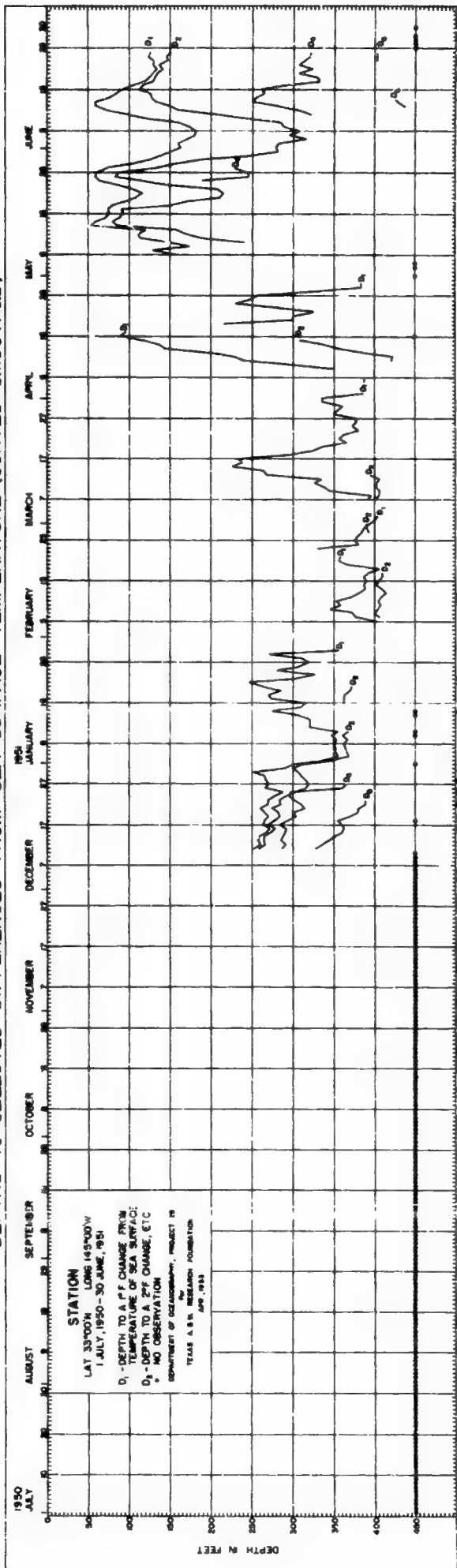
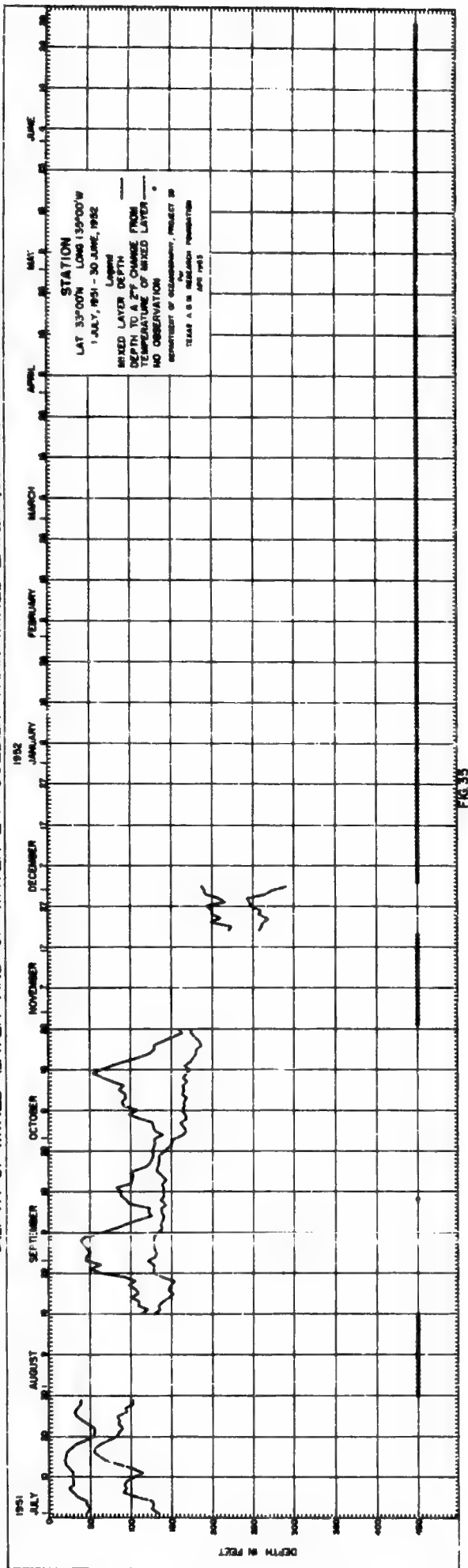


FIG 33

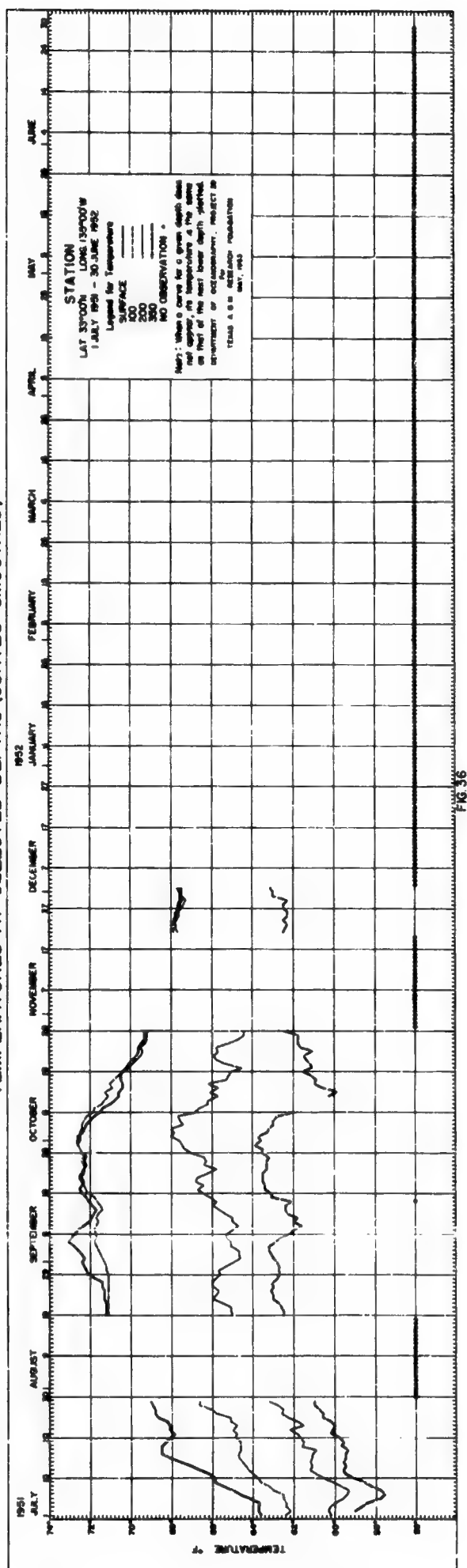
DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



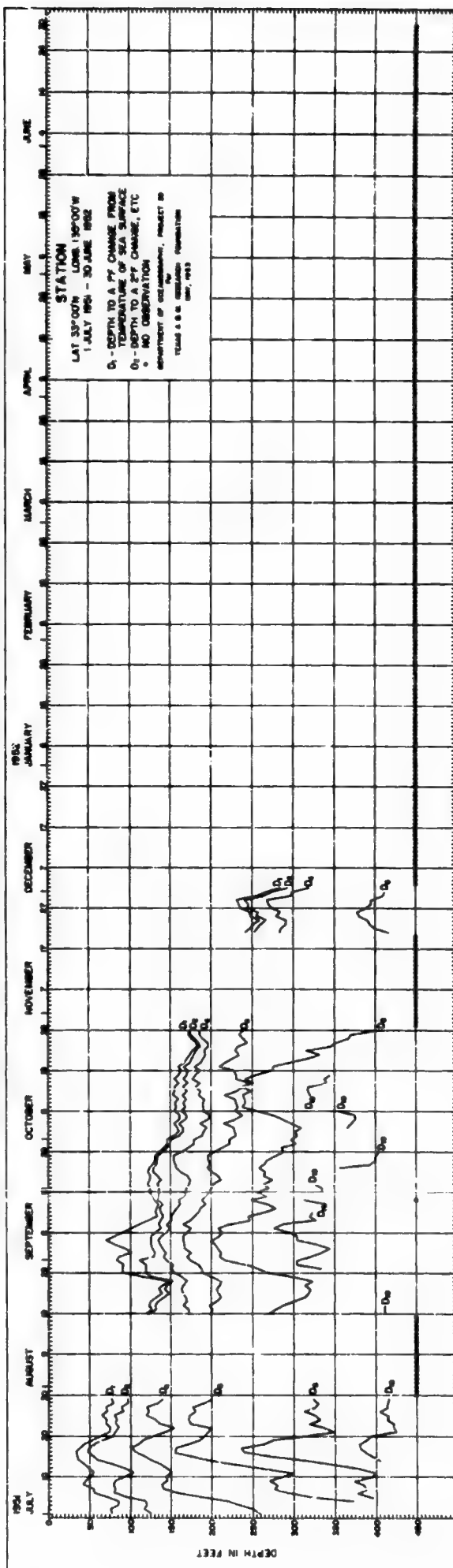
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER CURVES SMOOTHED)

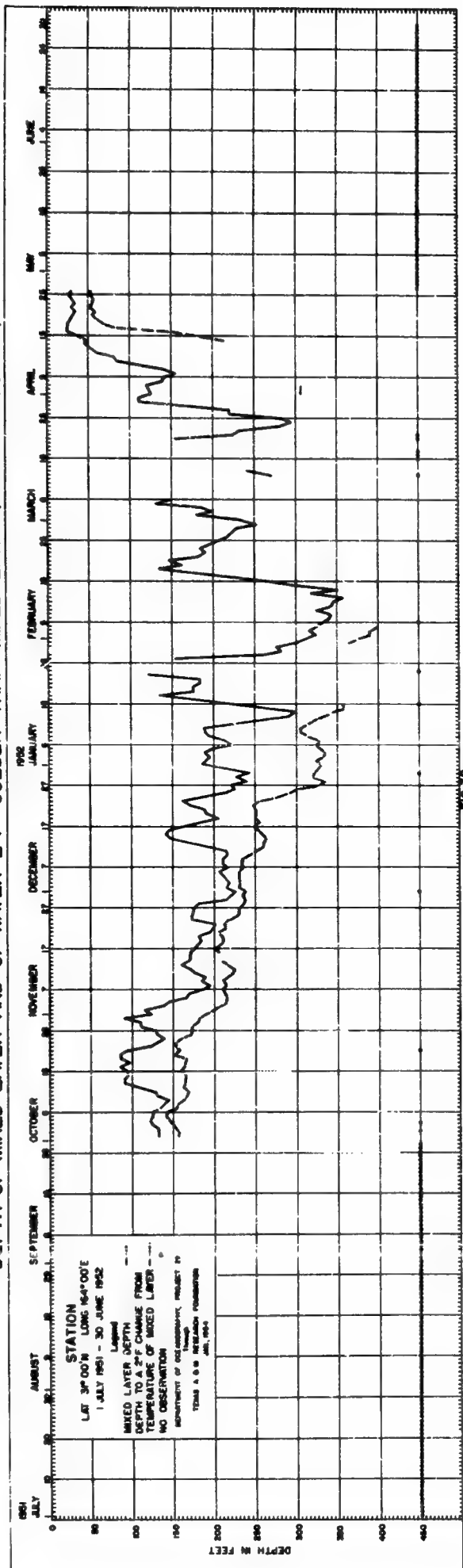


FIG. 38

TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

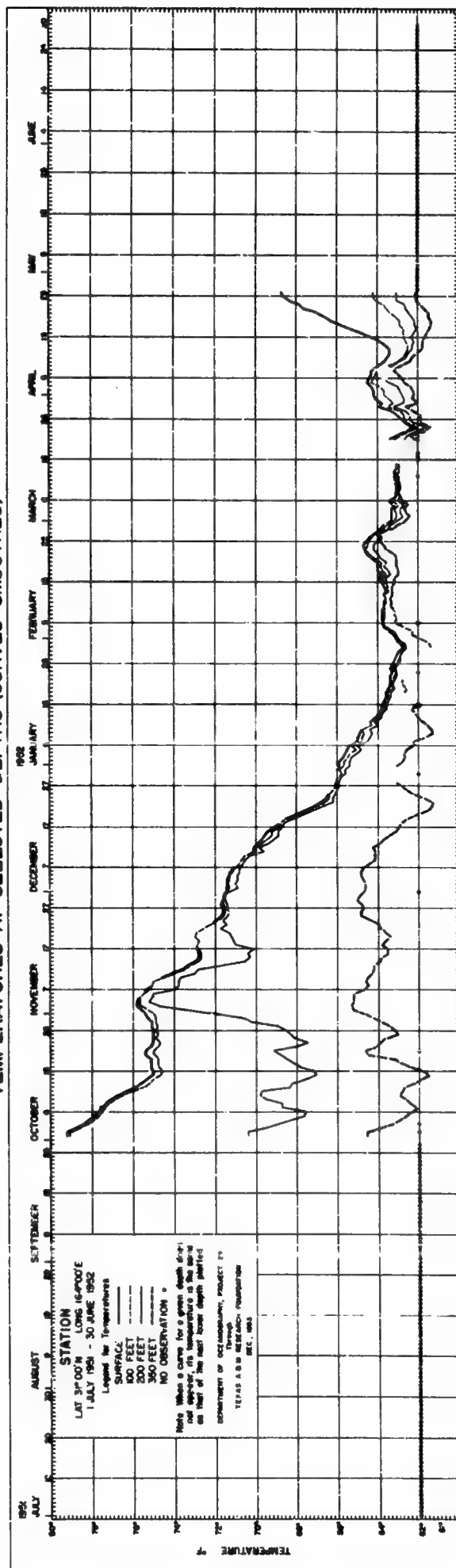
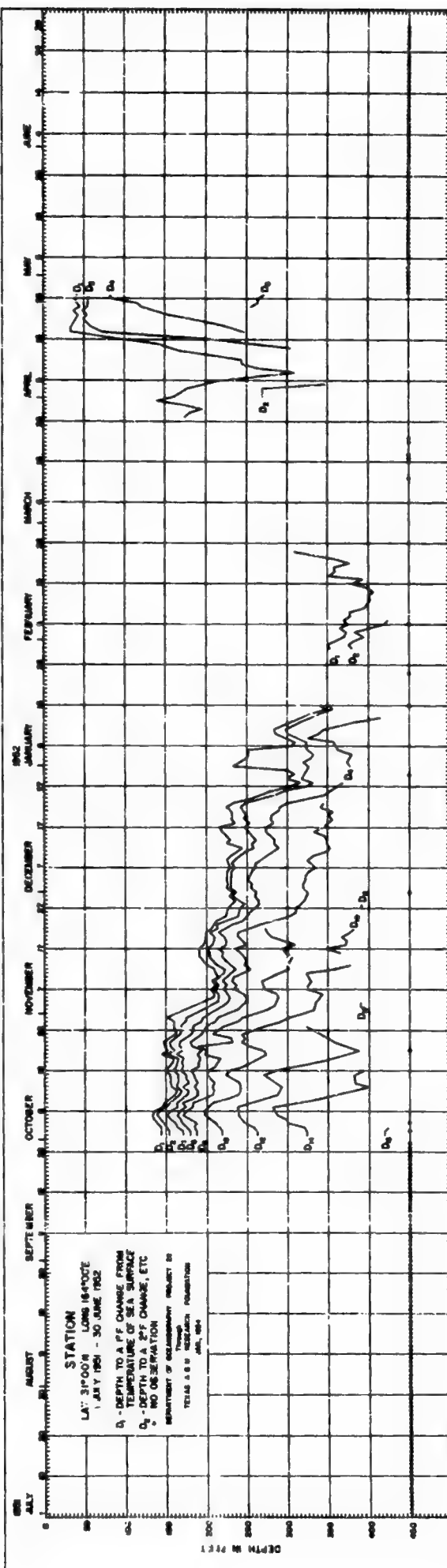


FIG. 39

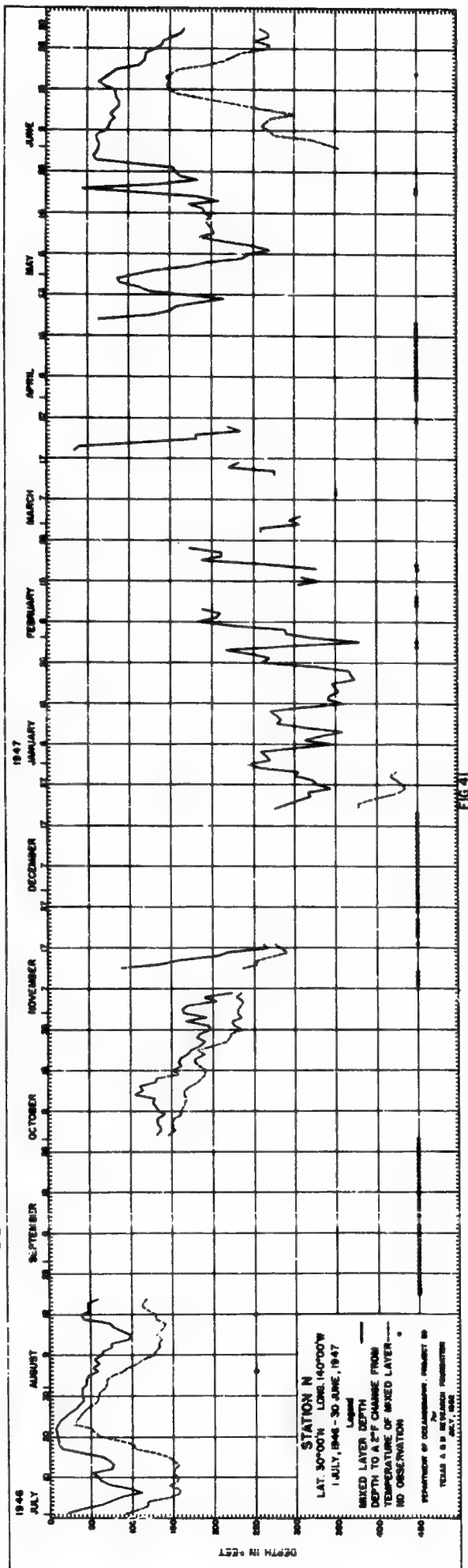


DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

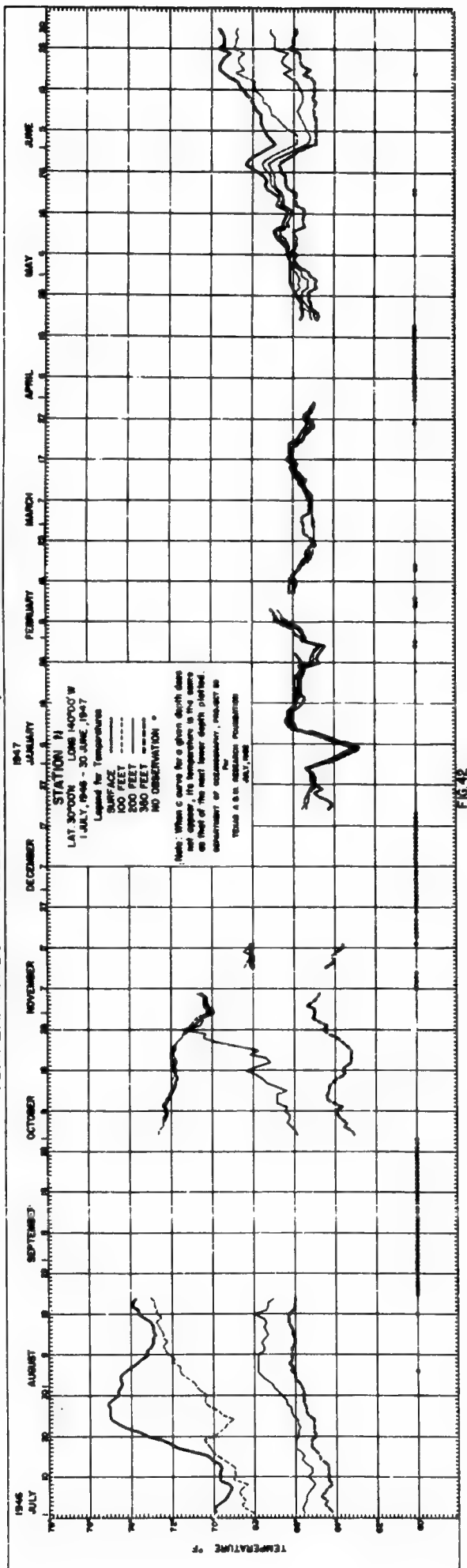


**FIG. 40**

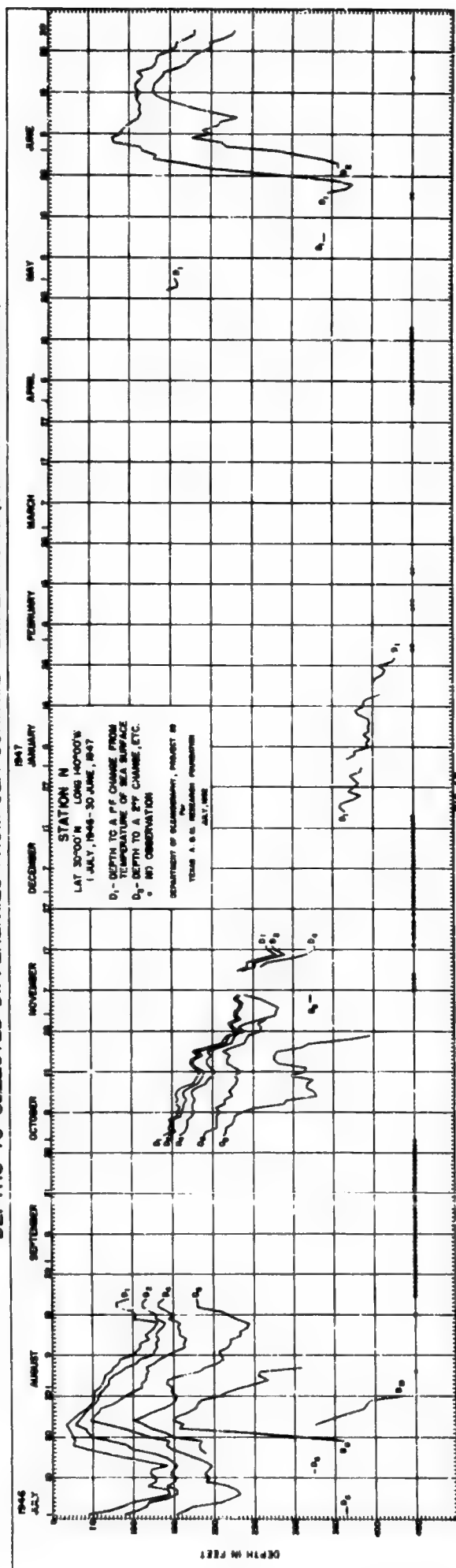
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



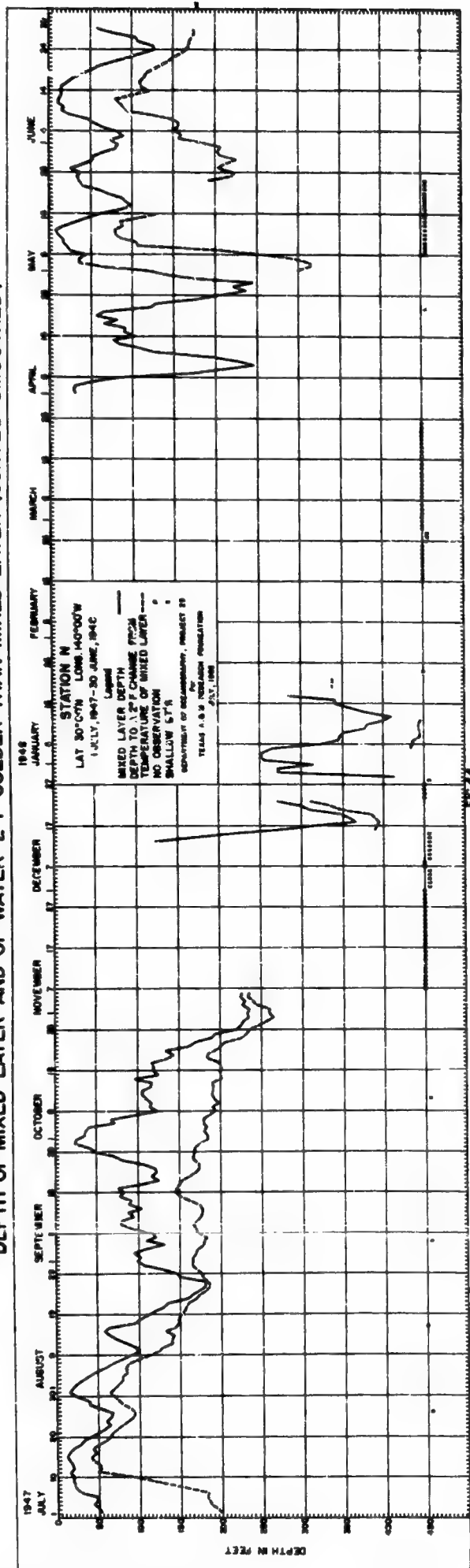
# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



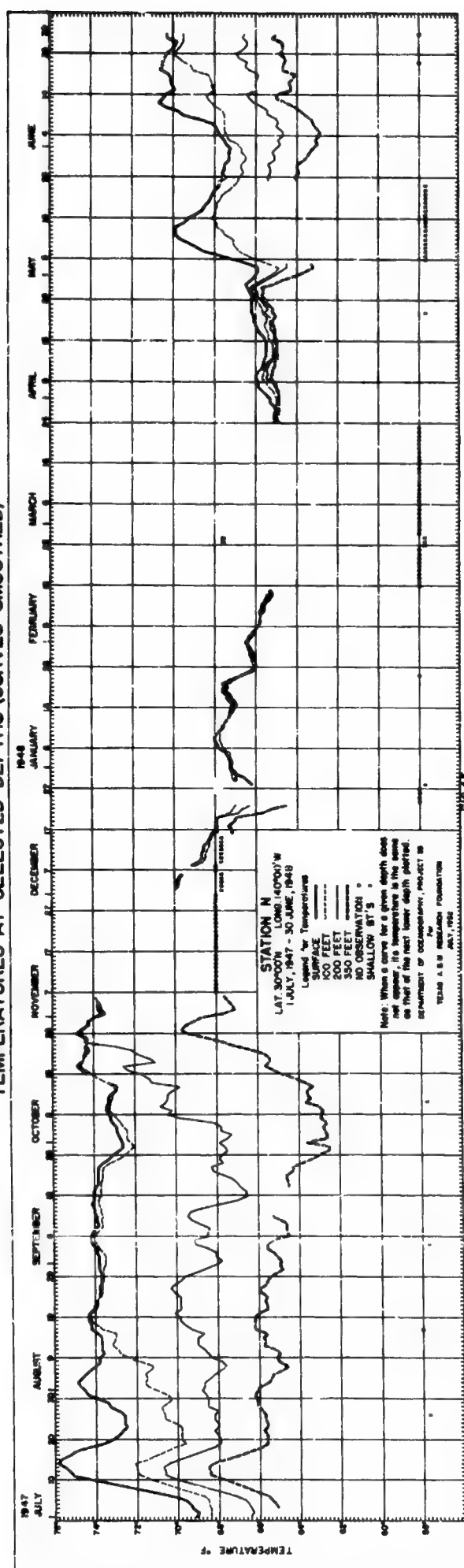
DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



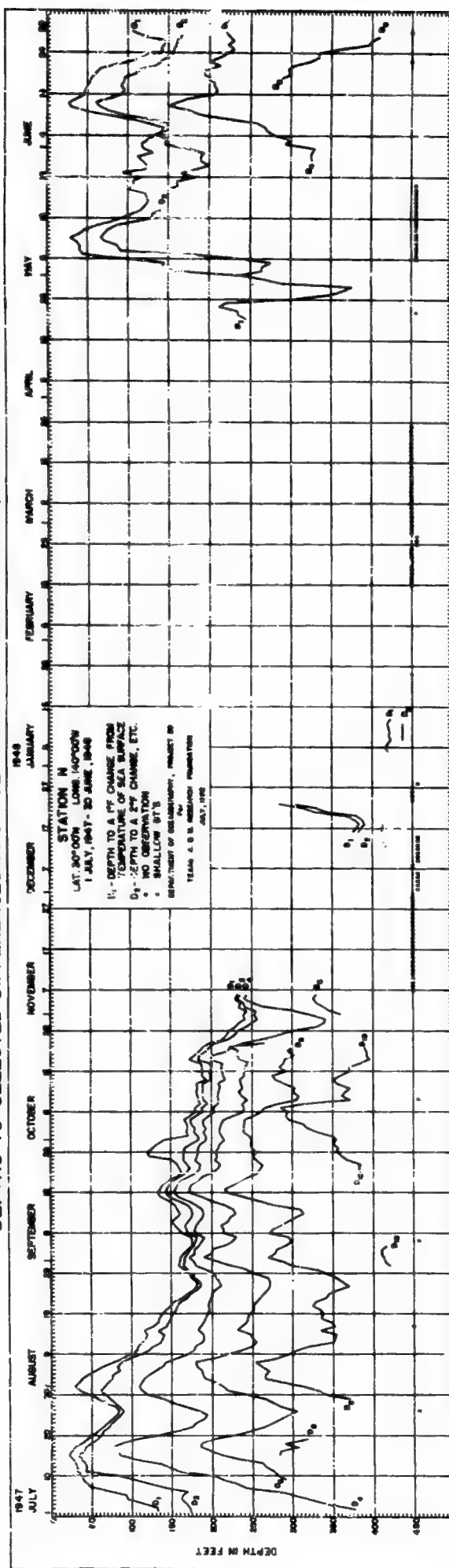
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



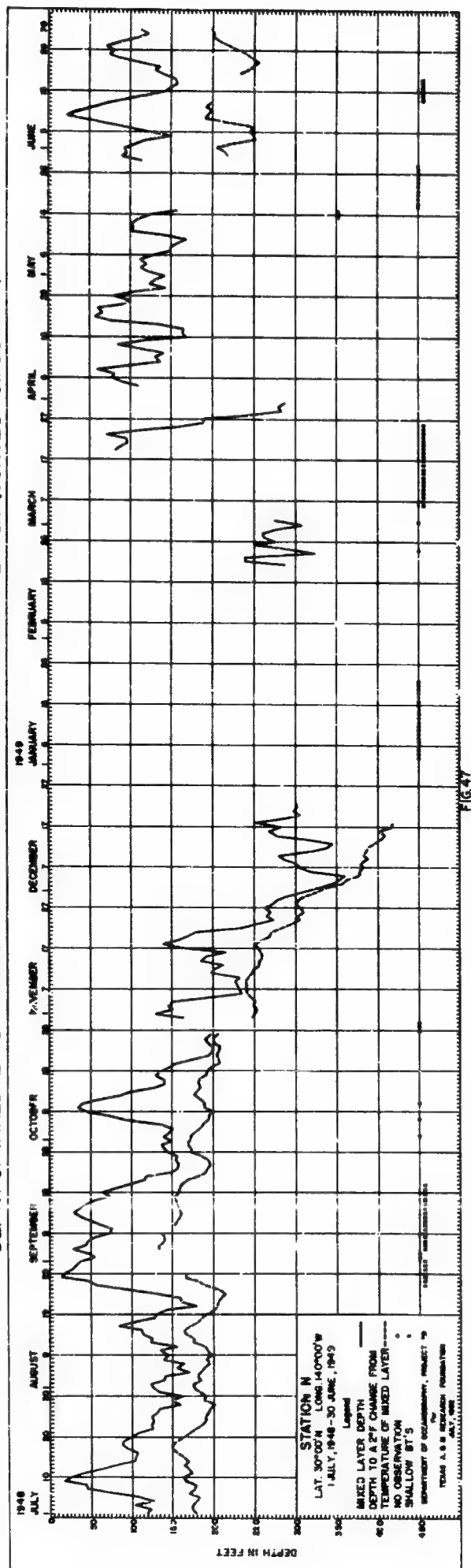
# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



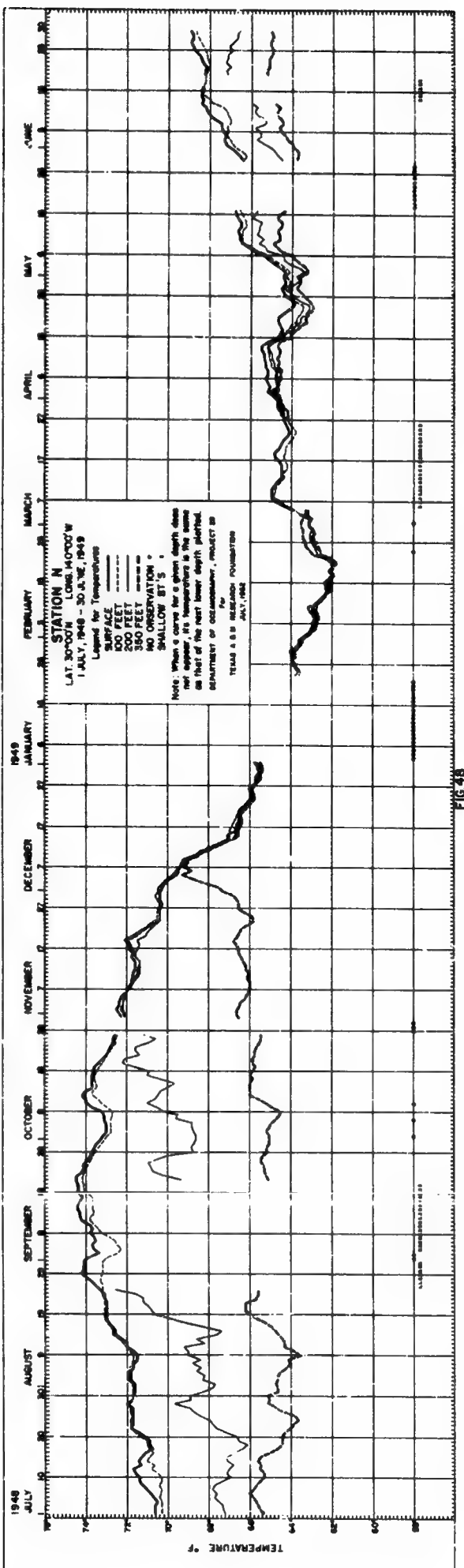
# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



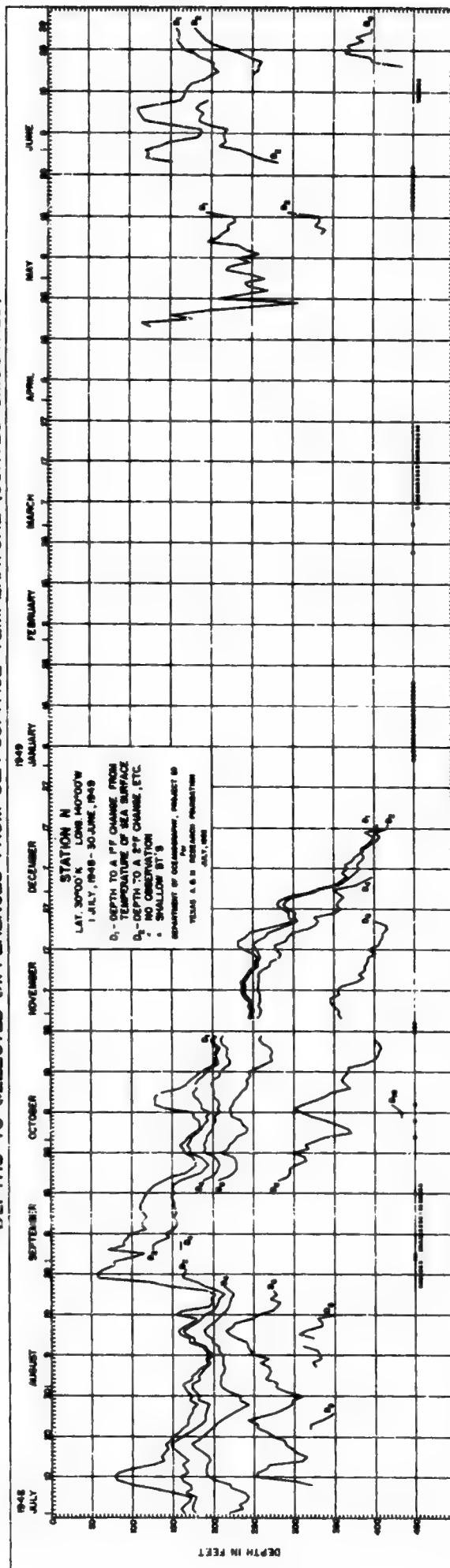
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



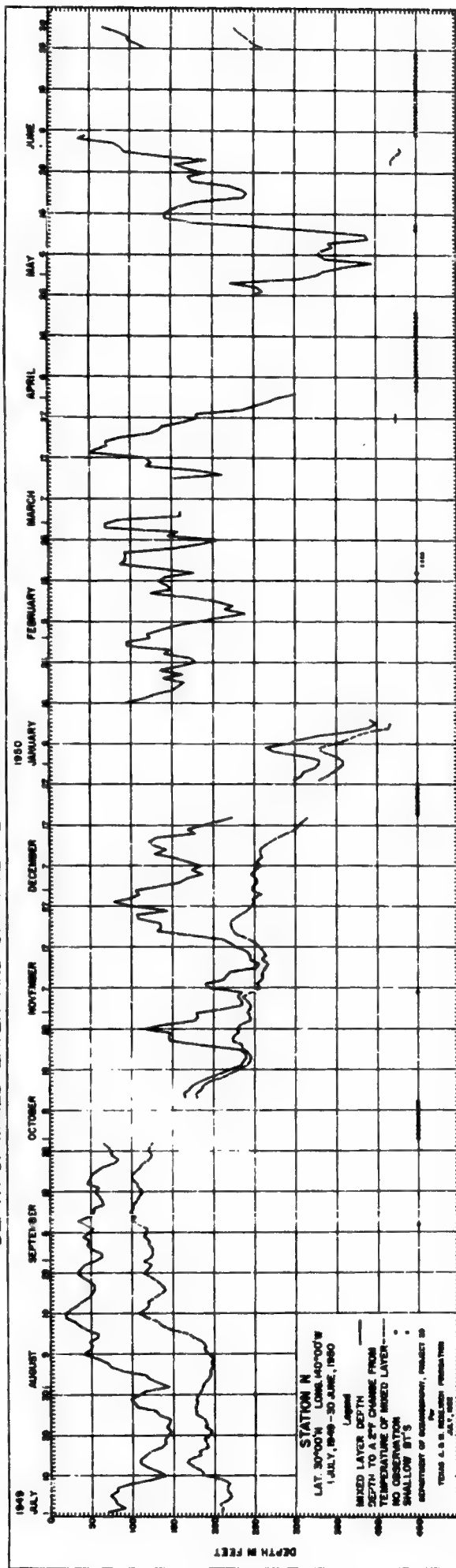
# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



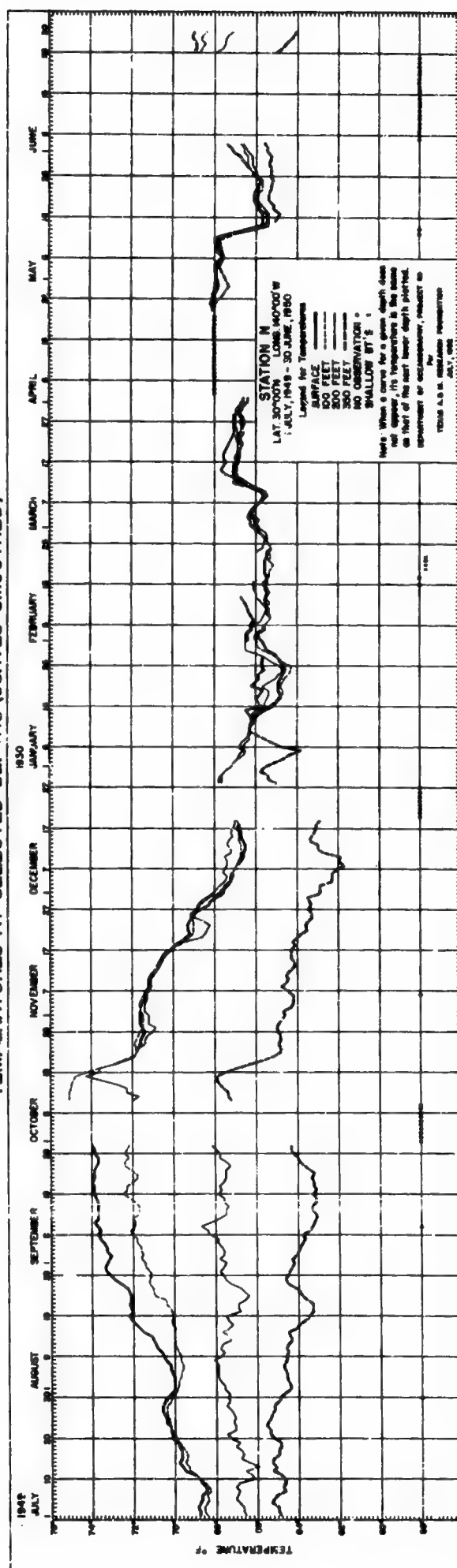
# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

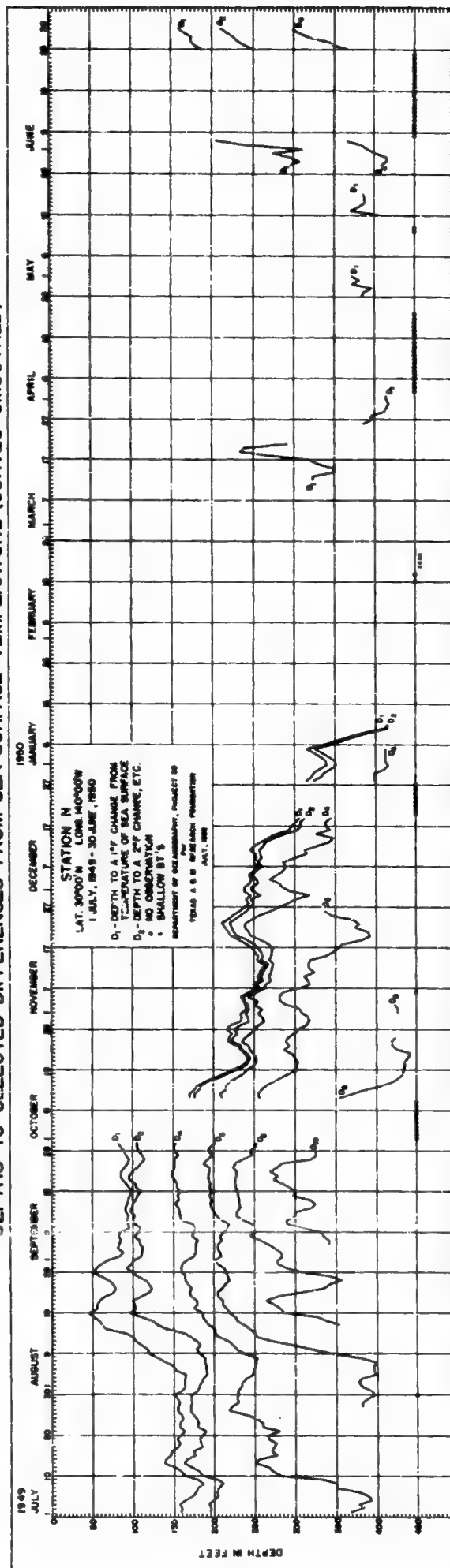


# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)

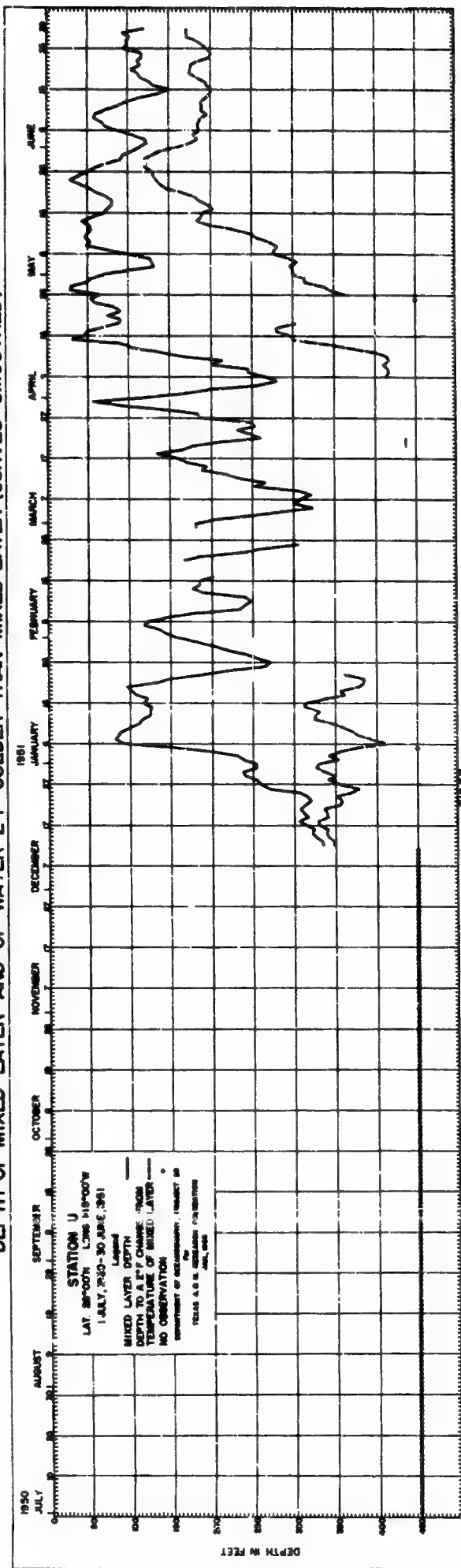




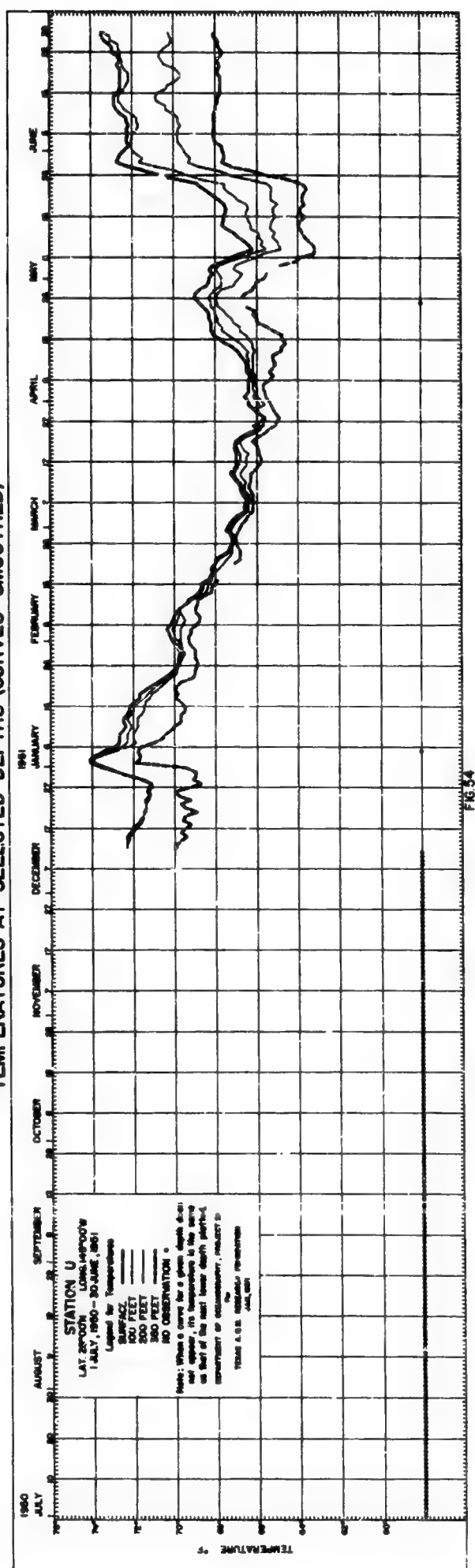
# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)



# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

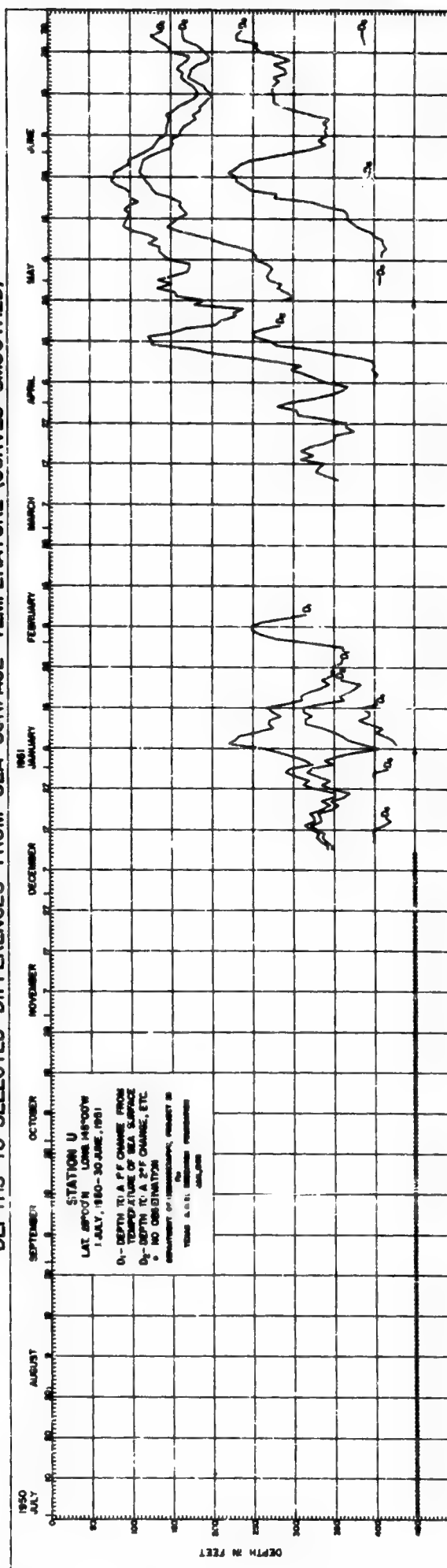


FIG 53

STATION U  
LST. SPOTON LONG 147°00'W  
1 JULY 1961 - 30 JUNE 1962

Legend  
— MIXED LAYER DEPTH  
--- TEMPERATURE OF MIXED LAYER  
... NO OBSERVATION

TEMP. & S.S. OBSERVATIONS  
1961, 1962

DEPTH IN FEET

1961 JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER JANUARY FEBRUARY MARCH APRIL MAY JUNE

**STATION U**  
 LAT 28°00'N LONG 155°00'W  
 1 JULY 1951 - 30 JUNE 1952

Legend for Temperature:  
 — SURFACE  
 — 100  
 — 200  
 — 300

Legend for Salinity:  
 — NO OBSERVATION

Note: When a curve for a given depth does not appear, the temperature is the same as that of the next lower depth plotted, or, if necessary, the surface temperature or salinity, subject to the usual A.S.T. and S.S.T. corrections.

TEMP. A.S.T. AND S.S.T. FOR 1951-1952

# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

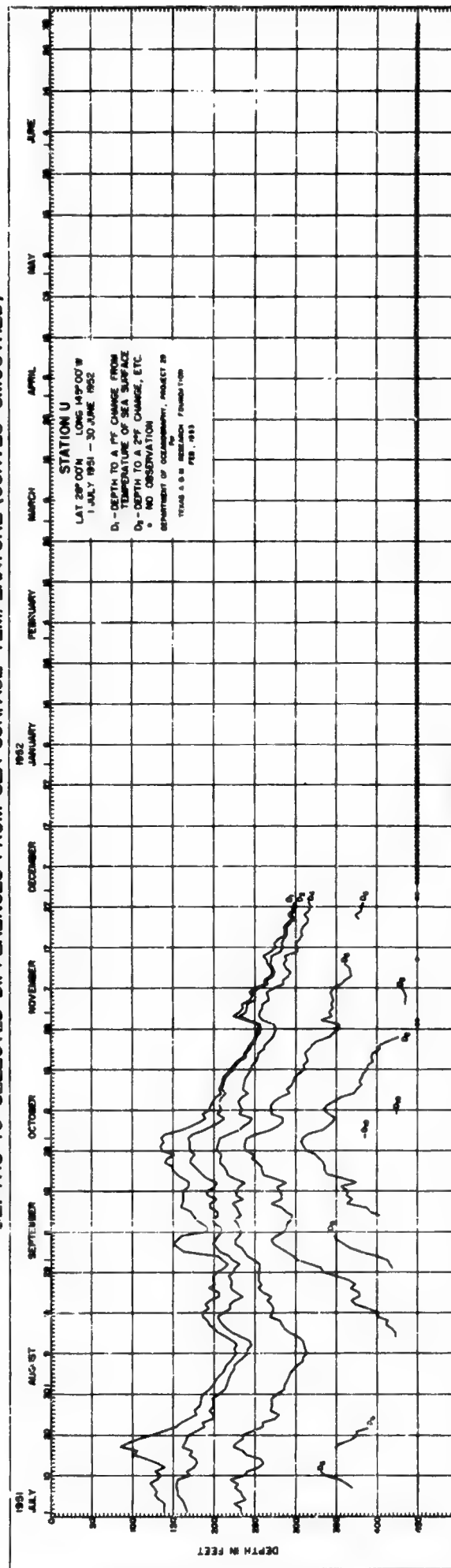
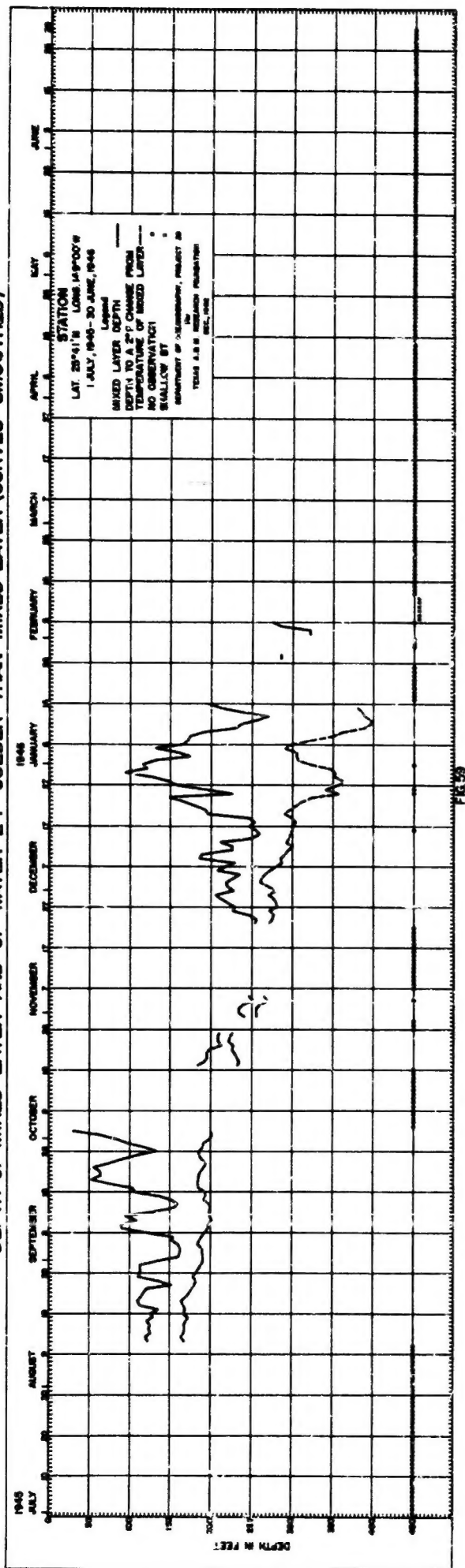
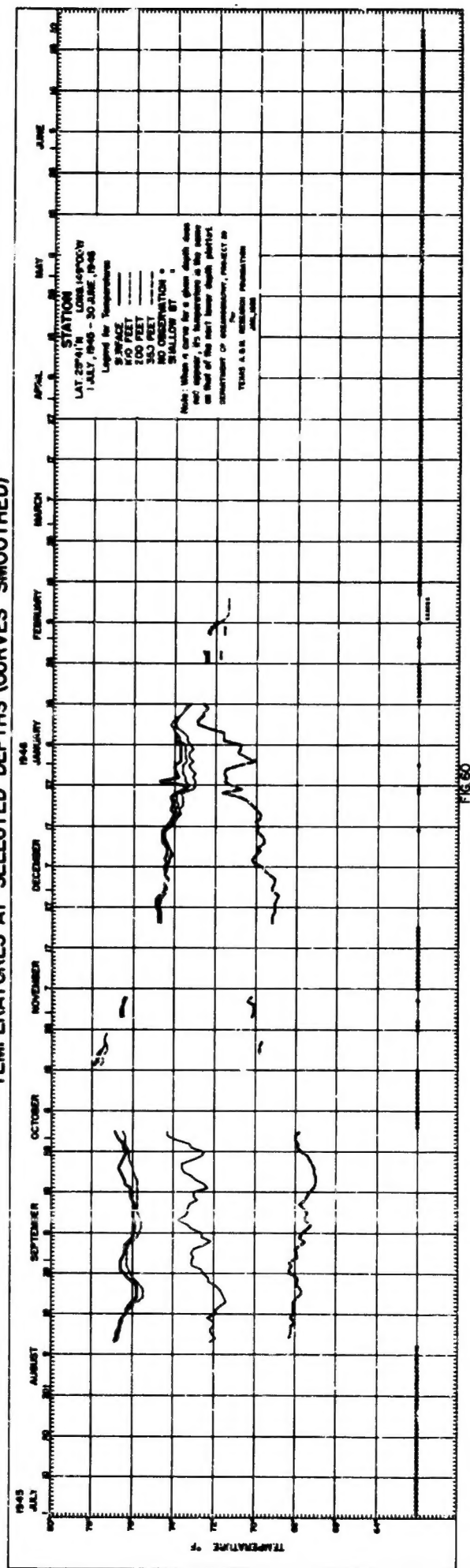


FIG 56

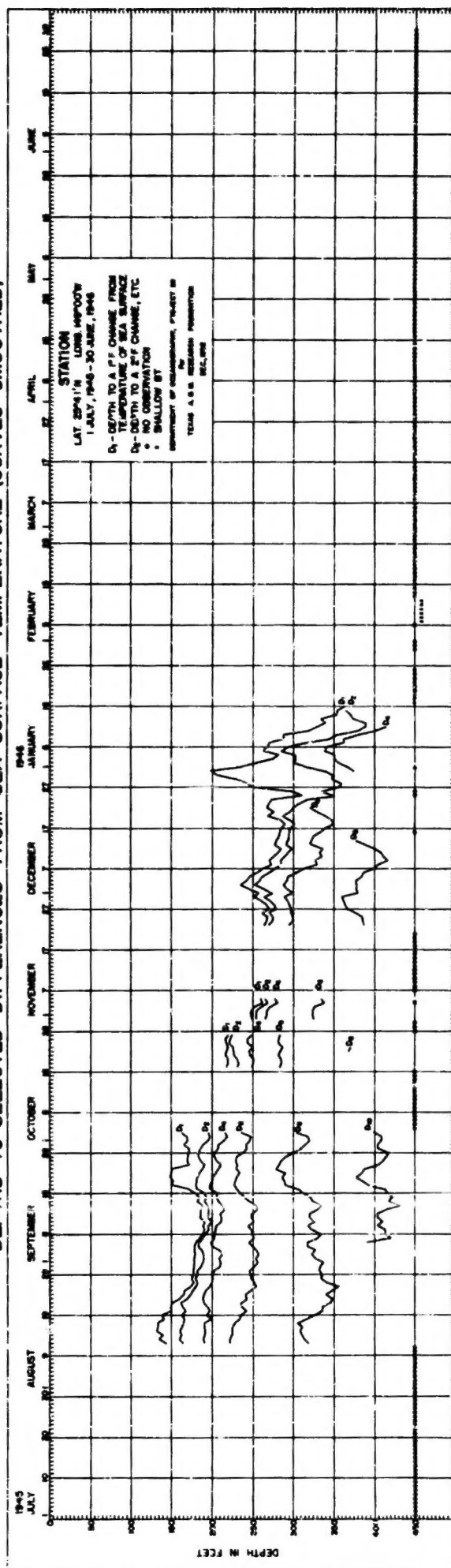
# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)



# TEMPERATURES AT SELECTED DEPTHS (CURVES SMOOTHED)



# DEPTHS TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)





# DEPTH OF MIXED LAYER AND OF WATER 2°F COLDER THAN MIXED LAYER (CURVES SMOOTHED)

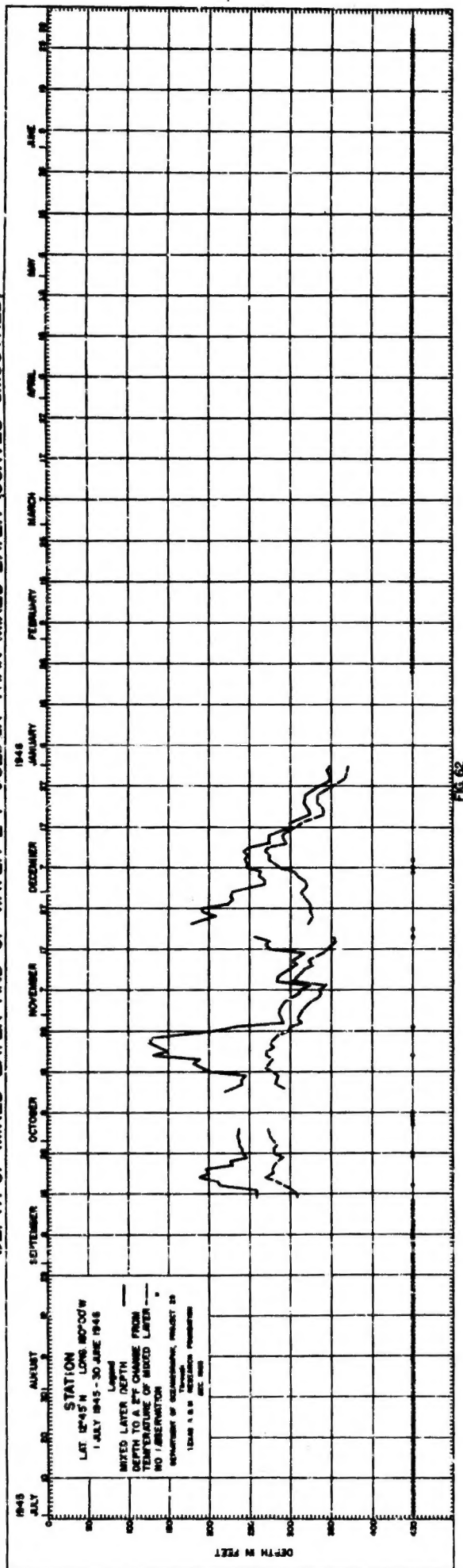


FIG 62

# TEMPERATURE AT SELECTED DEPTHS (CURVES SMOOTHED)

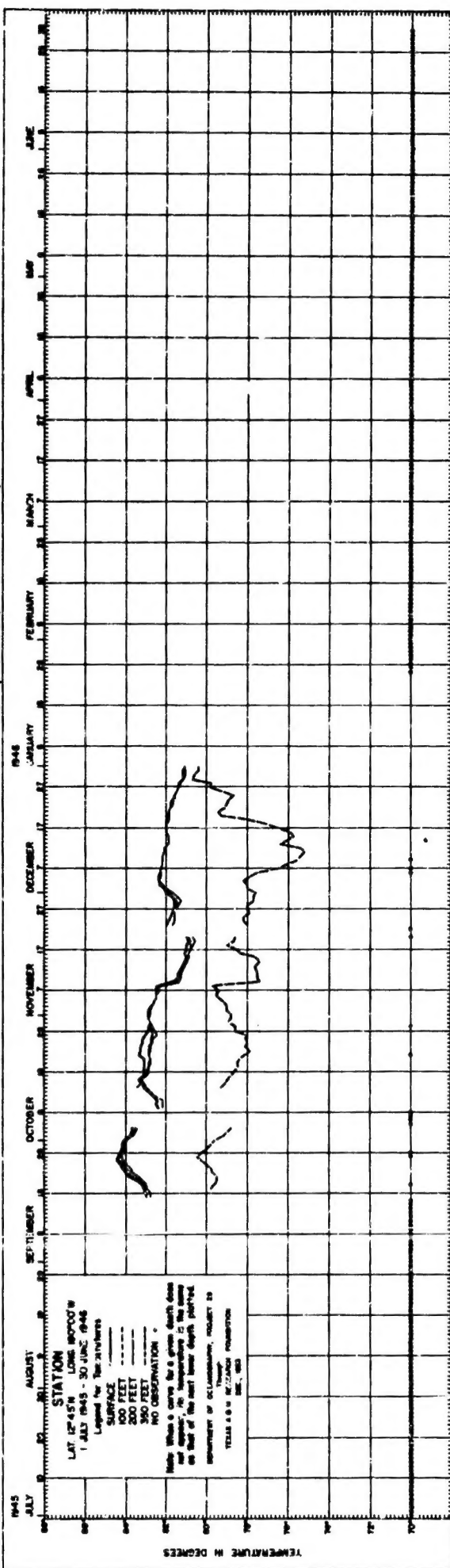


FIG 63



# DEPTH TO SELECTED DIFFERENCES FROM SEA SURFACE TEMPERATURE (CURVES SMOOTHED)

